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Subject **Page**

CENTRAL BODY ELECTRONICS

Model: **E52**

Production Date: **03/00 to Present**

Objectives of the Module

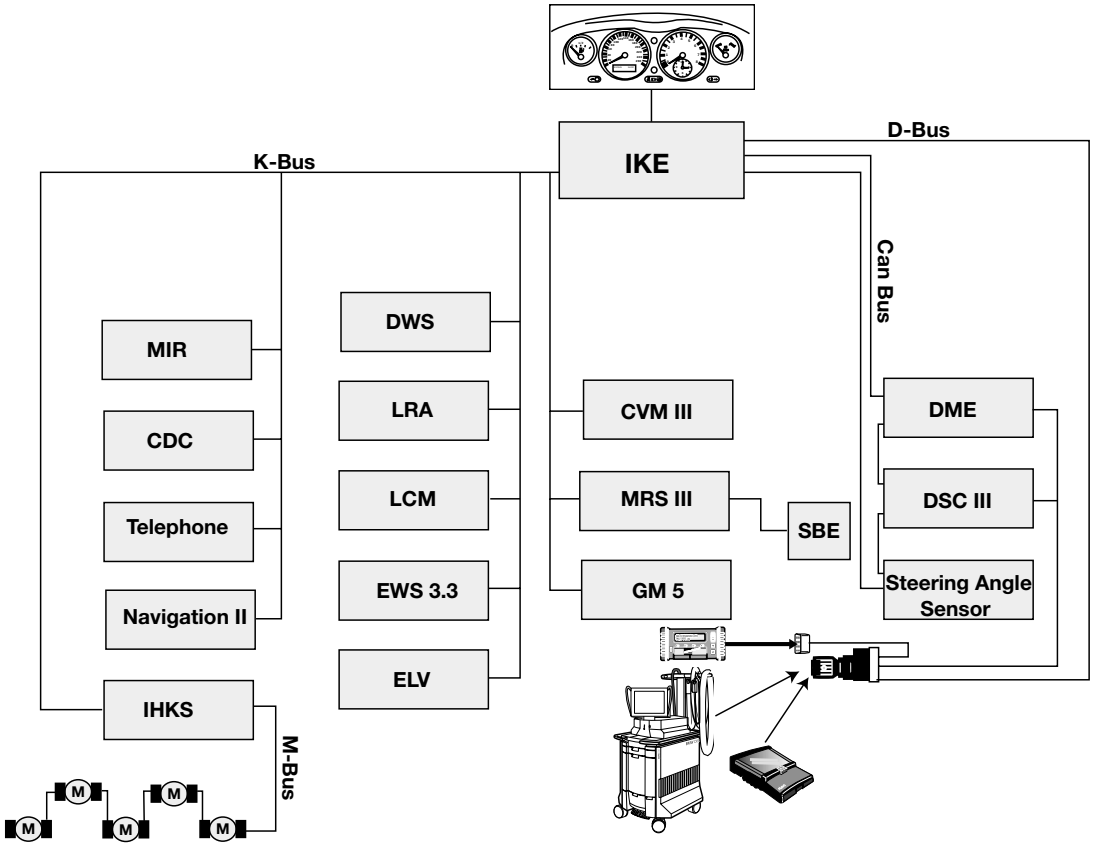
After completing this module, you will be able to:

- Describe the functions of the ZKE sub systems.
- Locate the various fuse boxes.
- Name the bus systems used on the Z8.
- Identify the locations of the control modules.
- Describe 3 ways to open the trunk.
- Describe SDR operation.
- Understand Neon Lights Technology.
- Identify the ELV components and their locations

Vehicle Electrical System

Purpose of the System

The state of the art Z8 electrical system satisfies all of today's demanding requirements. The Z8 electrical system is developed from the E46 concept.



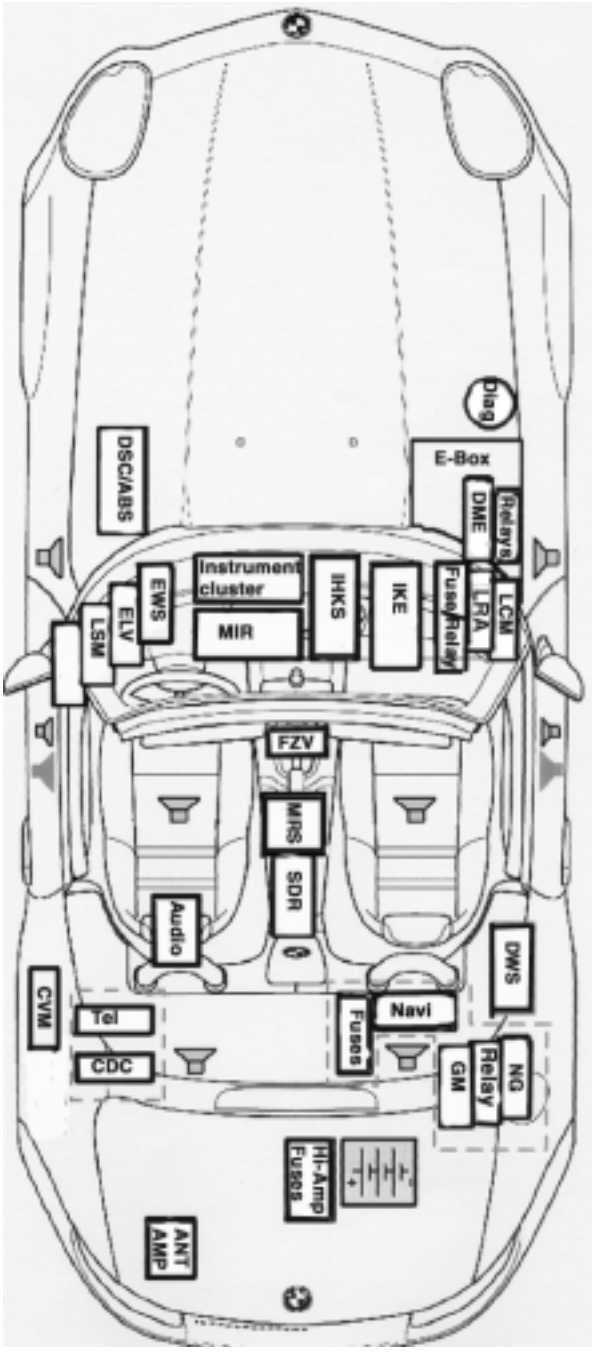
The Z8 electrical system concept with its stringent power and weight requirements that BMW places on all sports cars was considered in wiring harness production.

The wiring harness is divided into *three sections:*
(Telephone provisions can be provided optionally)

1. Main wiring harness (repair kits for left front, right front and right rear)

2. Audio/navigation (left rear, no repair kit)

Control Unit Locations



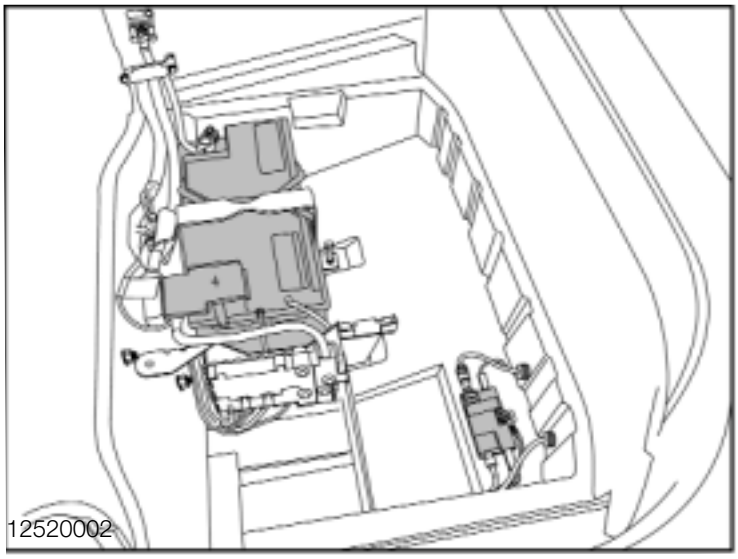
Abbrev.	Description
EWS	Electronic Vehicle Immobilzation
ELV	Electronic Steering Lock
E-Box	E-Box
CVM	Convertible Top Module
DSC	Dynamic Stability Control
DME	Digital Motor Electronics
Diag.	Diagnosis Connector
CVM	Convertible Top Module
CDC	CD Changer
ELV	Electronic Steering Lock
Audio	Audio Amplifier
ANT	Antenna Amplifier
FZV	Radio Central Locking
GM	General Module
Hi Amp	Main Fuses
IHKS	Air Conditioning
IKE	Instrument Cluster Module
Instrument Cluster	Instrument Cluster Display
LCM	Light Check Module
LSM	Steering Column Module
LRA	Headlight Vertical Arm Control
MRS	Airbag Control Unit
Navi	Navigation Computer
NG	Tilt Sensor
MIR	Multi-Information Radio
Tel.	Telephone

Power and Fuse Layouts

The vehicle battery is located in the trunk floor along with the tool kit.

The B+ cable is equipped with the familiar BST (see 1997 New Model Update Handout for additional information).

The “high amp” fuses are located next to the vehicle battery (shown to the right).



The glove box mounted fuse panel is located behind an access panel cover in the glovebox.

The fuse ID is also located on this cover (shown opened on the right).

65520002

There are additional vehicle fuses located in the Navigation cd storage compartment.


61520004

The E box is shown above containing the traditional engine fuses.

ZKE V

Purpose of the System

The **ZKE V** system is a new variant Central Body Electronics system unique to the Z8. Many of it's features and functions operate similarly to previous BMW ZKE systems with minor changes, added features, and refinements.

The following functions **are directly** controlled by the General Module V (GM V):

- Windshield wiping/washing and headlight washing
- Central locking with power trunk/fuel filler door release
- FZV Keyless Entry
- Power window control
- Anti-theft warning (DWA)

The following functions are included as body electrical systems but are **not directly** controlled by the GM V:

- Driver and Passenger seat electrical adjustment (no control module - switch controlled)
- Side Mirror - adjustment/heating (also includes windshield washer jet heating)
- Electrochromic rearview mirror
- MRS III

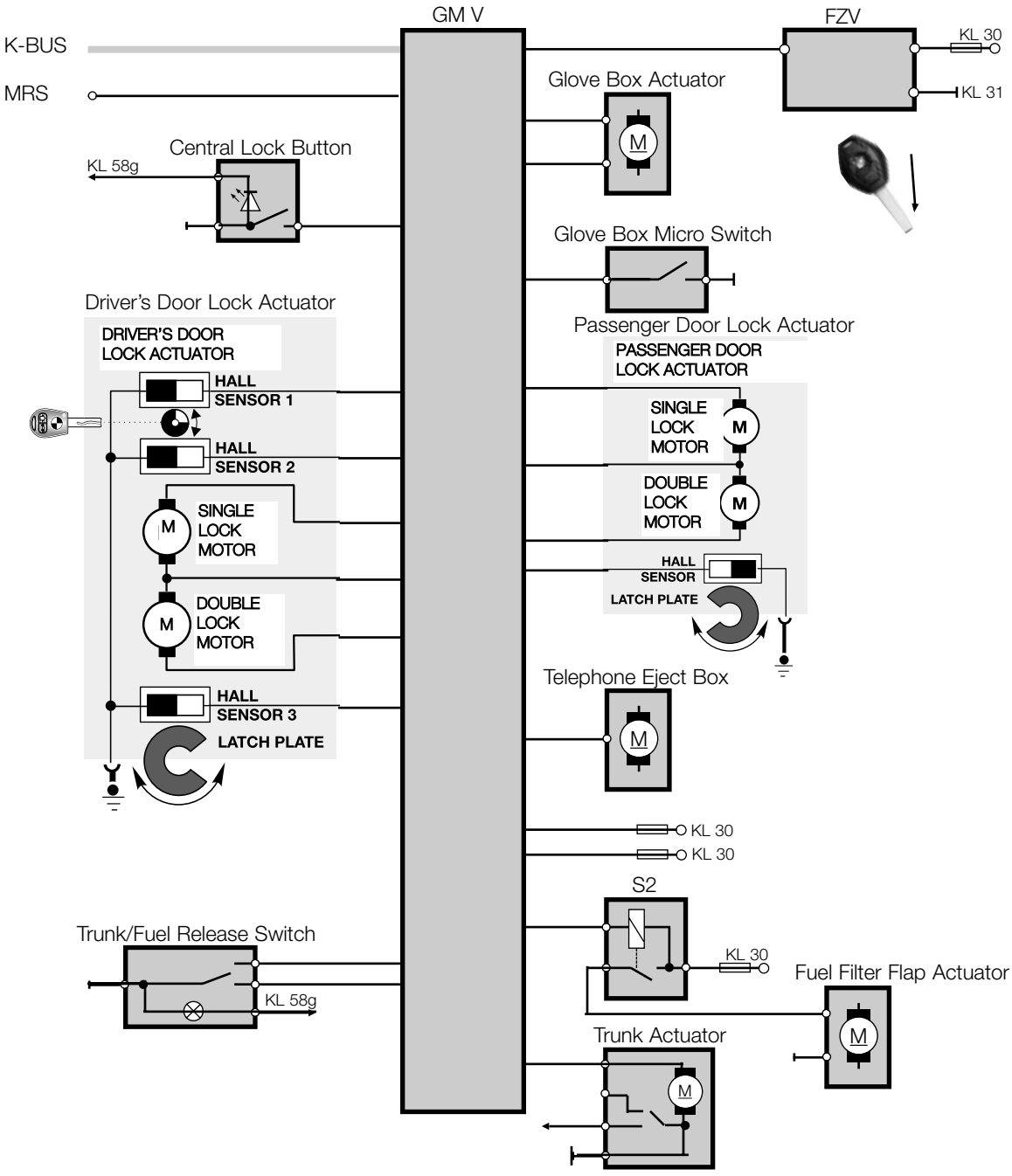
ZKE V introduces the following changes and new features:

- Similar to the E46 GM V, the Z8 GM V controls it's respective peripheral components directly (no P-Bus). It communicates with other pertinent control modules via the K-bus as does the E38/E39 GM V.

- The GM V is responsible for the Car/Key Memory feature. Key memory provides the added convenience of identifying users of the vehicle. Whenever the vehicle is locked or unlocked via the FZV keyless entry system, a unique key identification signal (key number) is transmitted to the General Module.

System Diagram

Central Locking System



The Central Locking system of ZKE V controls the door lock, trunk lock, fuel filler flap, glove box, telephone storage compartment, and DWA.

The familiar single/double locking strategy is maintained from previous systems with the introduction of a new style door lock mechanism combined with dual actuator motors (similar to E46).

The new style actuators are sealed, self contained units with no replaceable parts.

The door lock actuator use hall effect sensors in place of pin contacts and microswitches to provide:

- Door lock key position (driver's door only),
- Door open/closed status (replaces door jamb switch).

The passenger door is fitted with a manual locking knob which can lock the door if the vehicle battery were to fail. Simply slide the knob downward and close the door. It can not be opened from the outside. In this position, the door can be opened from the inside by pulling the inside door handle (2x).

The Driver's door lock location is the only point outside of the vehicle where the key can mechanically control all of the central locking system functions.

Shown to the right is the lock cylinder is protected by a spring loaded cover.

The central locking switch is located in the center console.

Locking the vehicle from the central switch (indicated by the arrow on the right) "single locks" the vehicle except for the fuel filler flap, glove box, and telephone storage compartment.

- The Z8 can be locked with the top down. When the vehicle is locked with the exterior mechanical key or FZV, the doors, glove box and telephone storage compartment are locked. Locking the glovebox with a “master Key” will also lock out the trunk and telephone storage compartment. The Navigation and cd changer storage compartments can be mechanically locked with a “master key”.

- The trunk can be unlocked remotely with the key (FZV) but does not lock/unlock the entire vehicle. The trunk can be opened by depressing the trunk button in the left kick panel. The mechanical release is located in the Navigation storage compartment.
- GM V and EWS 3.3 interface via the K bus to monitor double lock status and to initiate double lock override. This feature allows the doors to be opened from the inside if an accepted EWS key is switched on in the ignition when double locked.
- The selective unlocking feature of the E38/E39 is maintained on the ZKE V. A single unlock request from the driver’s door with the key or via the remote transmitter unlocks the driver’s door only. A second unlock request unlocks the passenger door.
- Car/Key memory coding allows the “single” locking to be activated after the vehicle is driven off.
- The Multiple Restraint System (MRS III) control module provides a switched signal to the GM in the event of an accident. The signal is an output function of the MRS control module and becomes active when MRS determines a crash has occurred. When active, the GM unlocks the door lock actuator, switches on the interior lights and signals the LCM via the K bus to activate the hazard warning flasher. Once the crash signal is active, the GM will not respond to lock requests from the system until the ignition switch is cycled or a front door is opened.
- Continuous locking/unlocking will initiate a timed arrest of the locking system. The GM counts each time the locks are actuated. After approximately 12 cycles, the timed arrest is active. The timed arrest is deactivated one actuator cycle for every 8 seconds until the counter is reset to 0. The timed arrest is overridden if a crash signal is received from the MRS III.

The driver's door lock provides the following familiar signals to the General Module:

- Lock / Unlock
- DWA arm/disarm
- Convenience closing and opening signals
- Provides a mechanical link to manually lock/unlock the actuator in the event of a failure.
- The GM monitors these key positions over two wires. The signals are generated by two hall effect sensors (Hall Sensor 1 & 2) located in the actuator.

Hall sensor 1 & 2 is not included in the passenger door actuator.

When the key is turned, a plastic cylinder in the lock actuator is simultaneously rotated by the lock tumbler extension rod. An asymmetrical shaped magnet is incorporated in the plastic cylinder, which when rotated changes the magnetic influence on the hall sensors. The presence of a magnet in close proximity to the sensing surface of either hall sensor creates a coded input over the two wires that the GM uses to determine the key position.

- Magnet in front of sensor, current flow through the sensor is <5 mA **(0)**.
- Magnet rotated away from sensor, current flow through the sensor is >12 mA **(1)**.

Hall effect sensors improve the actuator reliability since they are impervious to moisture and there are no wear contacts.

- Key in the neutral position, both sensors are simultaneously influenced by the magnet - **0/0**.
- Key turned to the unlock position from neutral, hall sensor #1 magnet segment moves away from hall sensor - **1/0**.
- Key turned to lock position from neutral, hall sensor #2 magnet segment moves away form hall sensor - **0/1**.

There are two motors incorporated in each actuator that provide two separate functions:

- Single lock/unlock function. Also known as central lock, this motor controls the mechanical lock mechanism when the central lock button is pressed to single lock the vehicle. The lock mechanism is fully locked at this point but can still by opened from the interior by pulling an interior door handle **twice** or by pressing the central lock button again. When single lock function is activated, the fuel filler flap actuator, glove box, and telephone storage compartment is not locked.
- Double lock/unlock function. Also known as central arrest, this motor is activated only when the vehicle is locked from the outside at the driver's door lock with a key or when the GM receives a lock request from the FZV system. In this case the double lock motor is activated simultaneously with the single lock motor. The function of the double lock motor is to mechanically offset an internal rod disabling it from unlocking the vehicle from the interior. This prevents the doors from being unlocked by any means except from an unlock request at the driver's door or via the FZVremote key.

Note: This component has been disassembled to provide functional understanding. This component does not contain any replaceable parts and will void it's warranty if disassembled.

Door Contact Hall Sensor

Also included in the drivers door actuator is a third hall effect sensor. This sensor signals the door open/closed status to the GM. This sensor replaces the door jamb mechanical switch of previous systems. The rotary latch plate position activates the door contact hall sensor.

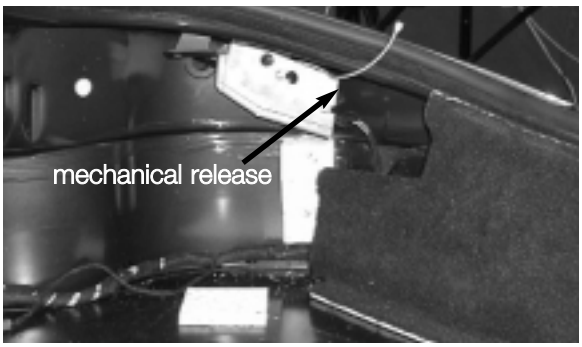
- When the door latch is closed, current flow through the sensor is <5 mA **(0)**.
- When the door is open, current flow through the sensor is >12 mA **(1)**.

The passenger side door actuator only includes this hall effect sensor (hall sensor 3). Hall sensors 1 & 2 are not required.

Fuel Filler Flap Remote Unlock

The fuel filler flap can be opened from inside the vehicle by pressing the remote button (combined with the trunk button) when the vehicle is unlocked or single locked from the central lock button.

The remote fuel filler flap button is locked out when the GM detects a vehicle speed signal > 4 MPH via the K-bus.



Trunk Remote Unlock

The trunk can be opened from inside the vehicle by pressing the remote trunk button when the vehicle is unlocked or single locked from the central lock button. The trunk can also be opened from the remote key (FZV).

The remote trunk button is locked out when the glove box is locked in the hotel setting and/or when the GM detects a vehicle speed signal > 4 MPH via the K-bus.

Windshield Wiping/Washing System

Model: **E52**
Production Date: **03/00 to Present**

Purpose of the System

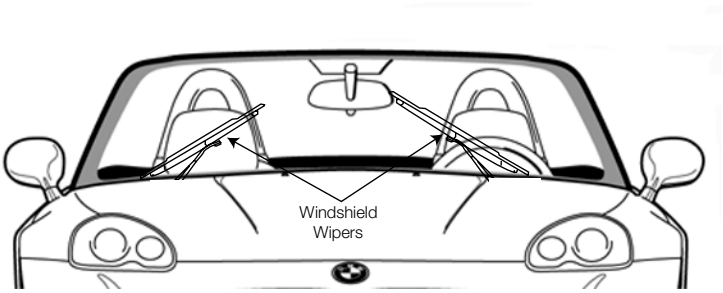
The Z8 windshield wiping/washing system is very traditional in operation, however an aggressive sport “look” has been given to the wiper arm mounting and articulation. The wiper arm mounting posts are positioned outboard on the windshield cowling.

The windshield wiping/washing system is similar to the E38/E39 system.

All wiping/washing functions are controlled by the GM V.

Output control of the wiper motor is through a windshield wiper double contact relay, which is located under the carpet below the glovebox.

The system has four wiping stages with interval wiping The wiping stage inputs are coded signals through a two wire link with a combination of high/low inputs as on previous systems.



The wiping stages include

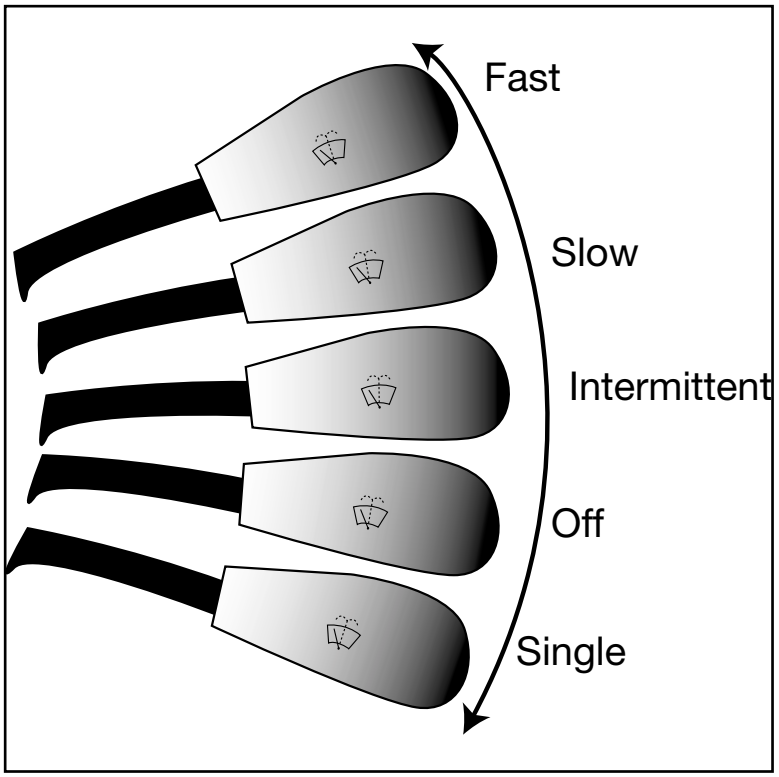
Single: Holding the wiper switch down in the single position provides a ground signal to activate the slow speed circuit providing wiper operation until the switch is released.

Intermittent: The intermittent wiping is activated by placing the switch in the first “up” position. Switching off the ignition in this position raises the wipers to the “service position”.

- The intermittent wiping intervals are dependent on the road speed.
- As road speed increases, the wiping interval delay is decreased.

Slow (I) and Fast (II): The stage I and stage II wiping speeds are also affected by road speed. The factory encoded settings are the same as previous systems:

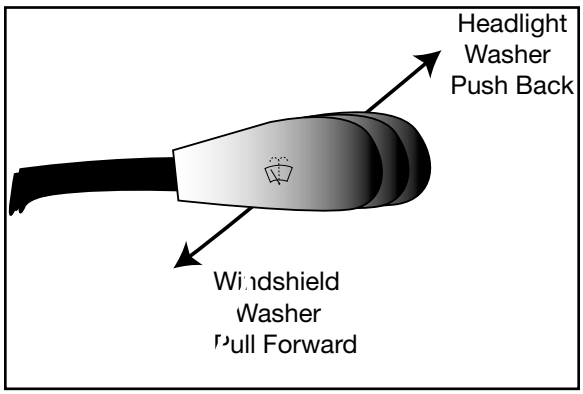
- Stage I automatically switches to intermittent when the vehicle is stopped, and resumes stage I when vehicle speed is present.
- Stage II automatically switches to stage I when the vehicle is stopped, and resumes stage II when vehicle speed is present.



Windshield/Headlight Washing

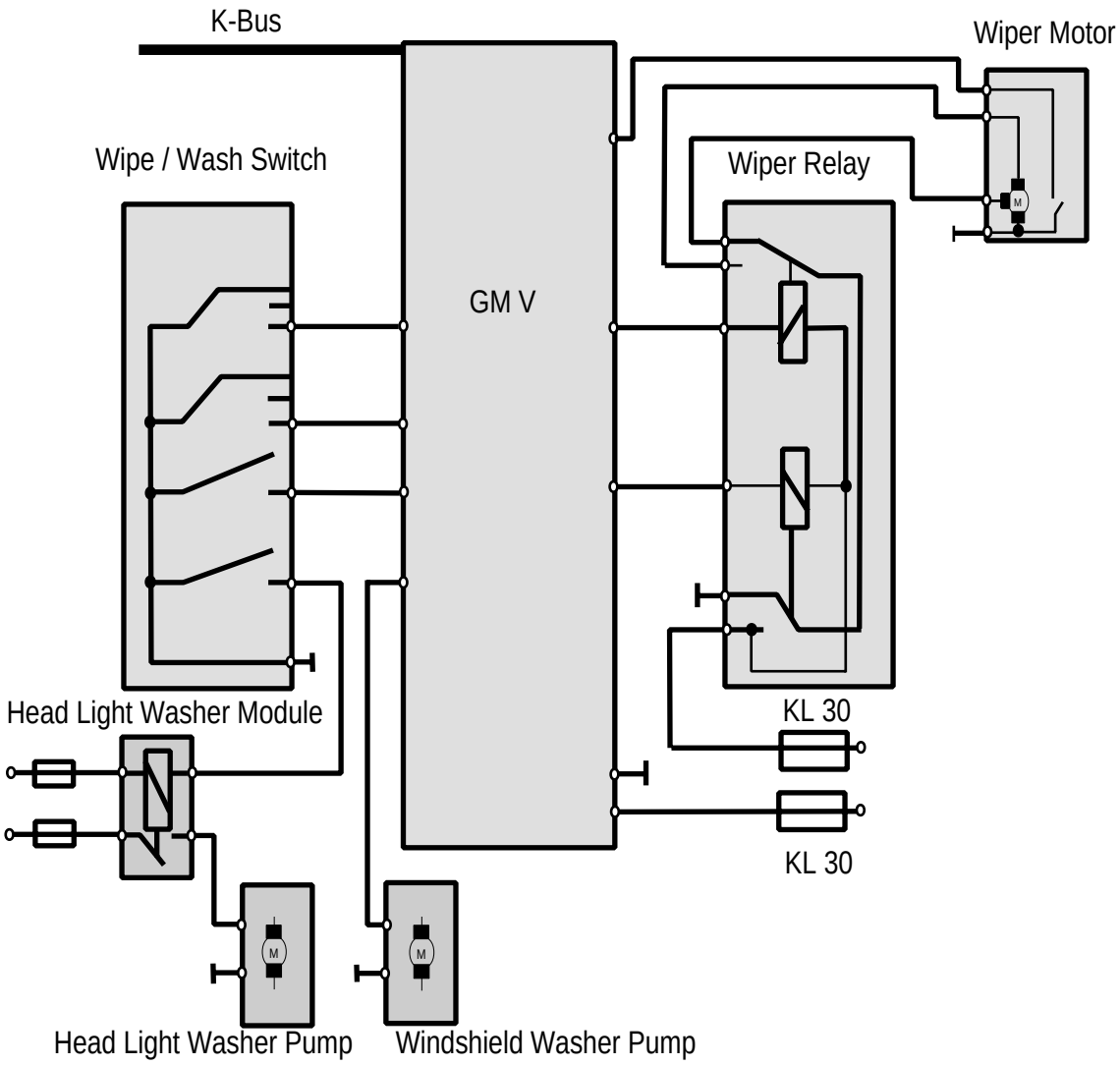
Windshield Washing: Pulling the Windshield Wiper Switch rearward closes the “windshield wash” contacts and provides a switched ground input to the GM. The GM activates the windshield washer pump directly via a power output final stage transistor. The wiper motor is also activated to wipe the glass clean.

Windshield/Headlight Washing: Pushing the windshield wiper switch forward requests windshield/headlight washing, regardless of the headlights being switched on or off. The signal activates the headlight washer relay which powers the headlight washer pump (nozzles are pressure opened) for 2 cycles. A time “arrest” (3 min.) will prevent unnecessary washing (which can be overridden by cycling the ignition). This system uses a common reservoir, located in the rear of the right front fender (5.3 L).



System Diagram

Wipe/Wash



Antitheft Warning System

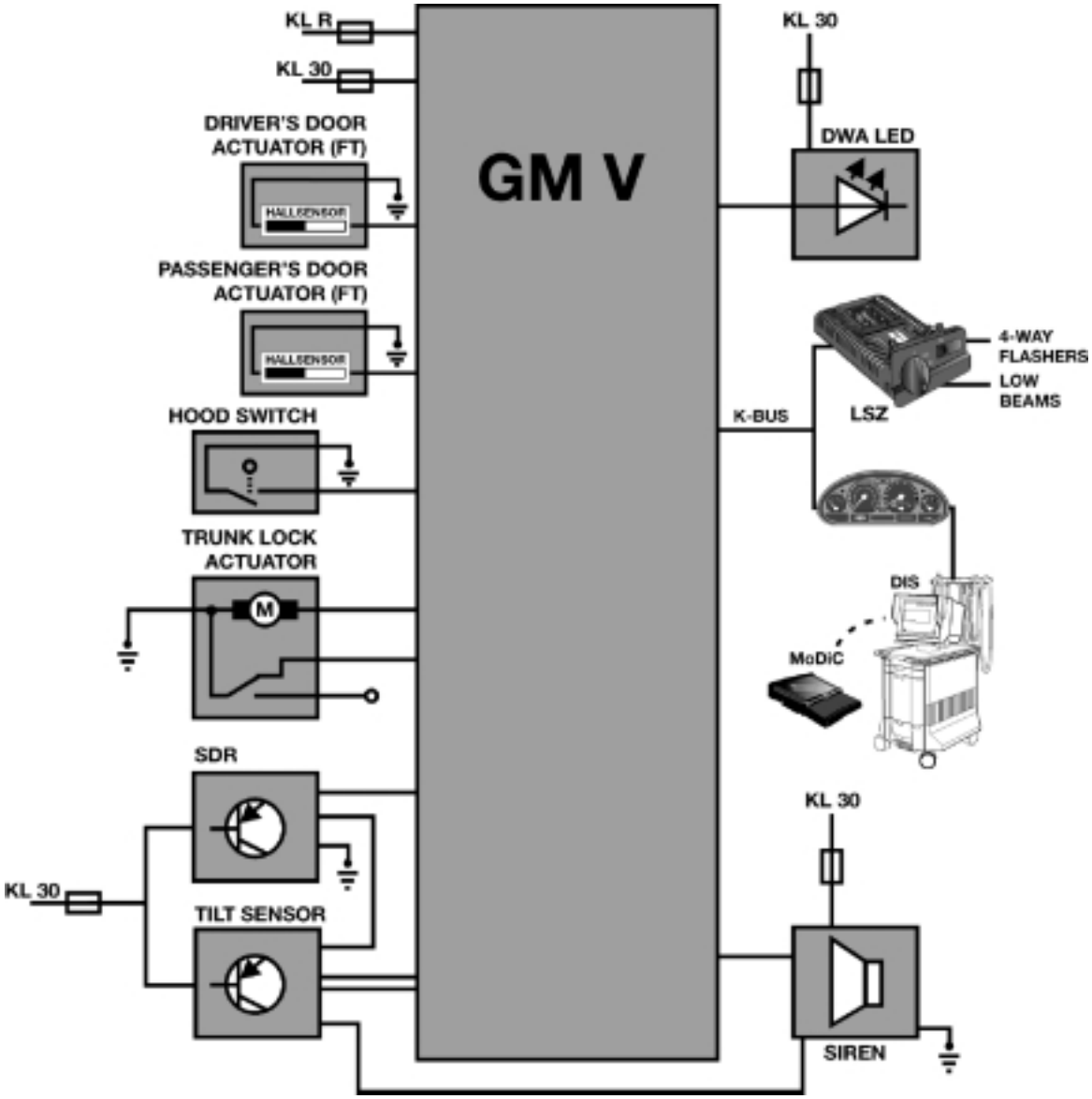
Purpose of the System

The Z8 is equipped with the familiar DWA that has traditionally protected BMWs with Antitheft Warning. In addition, DWA offers a superior protection package because the system uses pre-existing ZKE components.

The General Module utilizes existing components and/or circuits as part of the DWA system:

- Door Lock Hall Effect Sensor Contacts (door open/closed).
- Trunk Actuator Switch Contact (monitored for closed trunk).
- Trunk Open Request (FZV key) this signal prevents DWA from activating if armed when the trunk is opened with the key.
- Hood Switch.
- DWA Satus LED (part of rear view mirror).
- Tilt Sensor.
- DWA Siren.

Anti-Theft Warning System



Door Contacts

As mentioned in the Central Locking Section, the door lock contact hall effect sensors provide status of door open/closed.

- When the door latch is closed, current flow through the sensor is <5 mA (0).
- When the door is open, current flow through the sensor is >12 mA (1).

The GM will activate the siren if a door open signal becomes active when the DWA is armed.

Trunk Actuator Switch Contacts

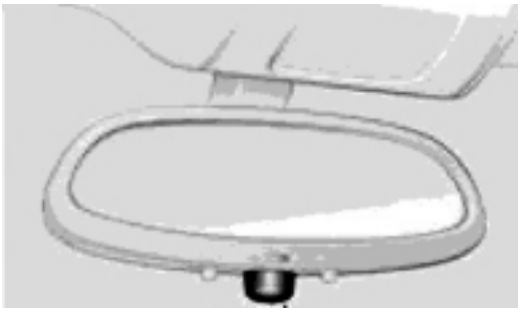
The trunk switch contact is located in the trunk lock actuator assembly. When closed, the trunk contact provides a ground signal to the GM signifying a "closed trunk". The GM will activate the siren if the trunk switch contact ground signal opens when the DWA is armed (except when using FZV).

Hood Contact Switch

Located on the left side engine compartment, the hood contact switch provides a ground signal to the GM signifying an open hood.

The plunger of this switch can be pulled up past a detente causing the switch contact to open (service position). This feature can be used to simulate a closed hood with the hood open when diagnosing the DWA system.

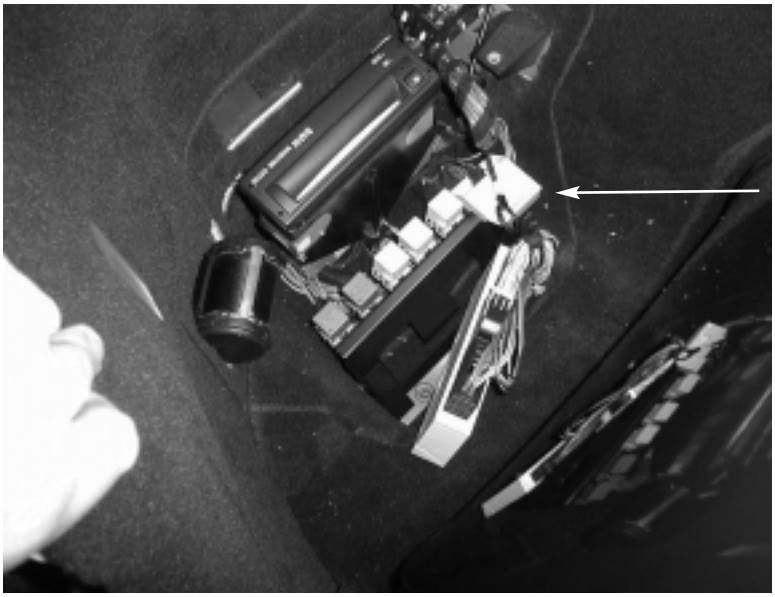
DWA LED



As on other BMWs, the DWA indicator is located in the rear view mirror. The LED is provided with constant battery voltage (KL 30). The GM provides a switched ground signal providing the various blinking signals used to convey DWA status to the vehicle operator (covered further on).

Tilt Sensor

Located in the Navigation storage compartment, the tilt sensor is an electronic sensing device with the sole purpose of monitoring the vehicle's parked angle when DWA is armed. This sensor is a new, one third smaller, solid state version (E46 similar).



The sensor requires three signal wires to perform its function:

- KL 30 - Constant battery voltage
- Signal "STDWA"; switched ground input signal provided by the GM indicating DWA armed/disarmed status. The tilt sensor is used as a splice location for the STDWA signal to the Siren and FIS interior protection sensor.
- Signal "NG"; switched ground output signal provided to the GM.
  The signal is used for **two purposes:**

  1. As a momentary acknowledgment that the tilt sensor received STDWA and is currently monitoring the vehicle angle.
  2. If the tilt sensor detects a change in the vehicle's angle when DWA is armed, signal NG is switched to inform the GM to activate the siren.

When the tilt sensor receives the STDWA signal from the GM it memorizes the vehicle's parked angle. The angle of the vehicle is monitored by the solid state electronics. Once armed, if the angle changes, the tilt sensor provides a switched ground signal to the GM to activate DWA.

Alarm Siren

- The DWA siren is installed in the vehicle cowl under the micro-filters. This location pro vides a secure position with loud acoustic output.
- The siren contains electronic circuitry for producing the warning tone when the alarm is triggered. The siren also contains a rechargeable battery that is used to power the siren when the alarm is triggered.
- The rechargeable battery will allow the siren to sound if it or the vehicle's battery is disconnected. The siren battery is recharged, from the vehicle's battery when DWA is not in the armed state.
- The siren has four wires connecting it to the system; *KL 30, KL 31, Signal STDWA* (arm/disarm signal from GM), and *Signal NG*(activate siren output signal to the GM)
- The arm/disarm output signal from the *GM* (STDWA) is provided to the Tilt sensor, SDR module and the siren simultaneously. The arm/disarm signal is a switched ground that signals the components of *DWA* armed/disarmed status.
- The activate siren signal (NG is high whether DWA is armed or disarmed). If a monitored input activates the alarm, the high signal to the siren is switched to a 50% duty cycle at the *GM*. The control circuitry in the siren activates the siren driver. If the *DWA* is armed and the battery is disconnected the siren recognizes the normally high *"NG" signal* as suddenly going low, the siren is also activated.

DWA Arming/Disarming

- The *DWA* is armed every time the vehicle is locked from the outside with the door lock cylinder or *FZV key*.
- The *LED* in the rear view mirror flashes as an acknowledgment along with the exterior lights and a momentary chirp from the siren.
- The *GM* monitors all required input signals for closed status (door closed, trunk closed, etc.) The inputs must be in a closed status for a minimum of 3 seconds for the *GM* to include them as an activation component. Change of status remonitors the inputs.
  Example: Hood being left open, then closed after the alarm has been set on.
- If the *DWA* is armed a second time within 10 seconds, the tilt sensor and interior protection (SDR) are also excluded as alarm activation components. This function is useful if the vehicle is transported on a train or flat bed truck to prevent false alarm activations.

While armed the trunk can be opened with out the alarm being triggered as follows:

- If opened with the trunk remote button via the *FZV*, the *GM* prevents the alarm from activating. When the trunk is returned to the closed position, it is no longer considered as an activation signal.

Panic Mode Operation: When the trunk button is pressed and held, the GM is signaled to activate the siren for the Panic Mode. The panic mode is function with either an armed or disarmed DWA system.

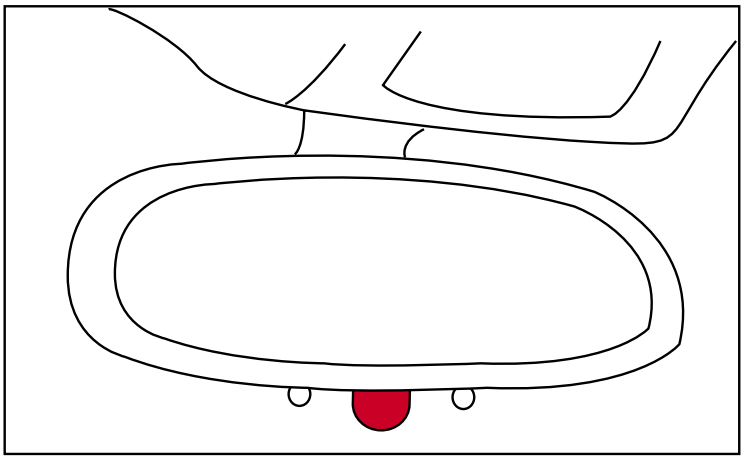
Emergency Disarming

Emergency disarming occurs automatically if a key is used to turn the ignition switch on and the *EWS III* accepts it. The *EWS III* signals the *GM* to unlock the doors and deactivate the *DWA*.

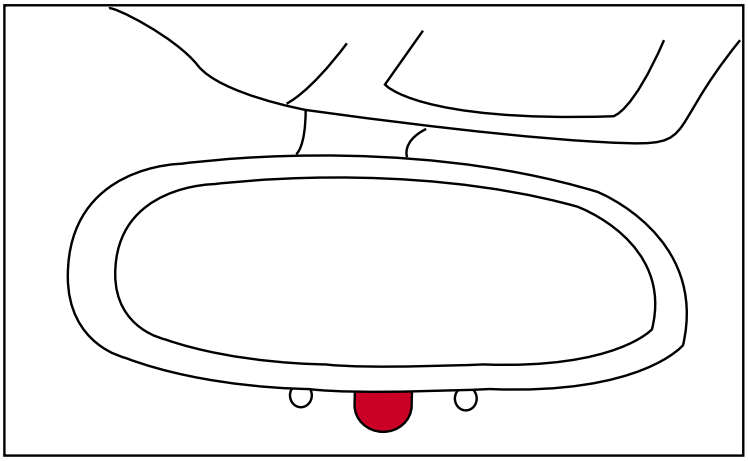
Alarm Indication

When the alarm is triggered, the siren will sound for 30 seconds. At the same time the parking and high beam lights will flash for 5 minutes. The *GM* signals the the *LCM* via the *K bus* to flash the lights.

Following an alarm trigger, the system will reset and trigger again if further tampering is done to the vehicle.



DWA LED Status



DWA STATUS	DWA LED CONDITION
Disarmed	Off
Armed	Continual slow flash
Armed with one or more monitored inputs not in closed position (ie: trunk not fully closed, etc.)	Rapid flash for 10 seconds, then continual slow flash.
Alarm activated	Rapid flash for 5 minutes then continual slow flash.
Rearmed in less then 10 seconds.	On for 1 second
Disarmed after activated alarm	Rapid flash for 10 seconds, then OFF.

Interior Lights

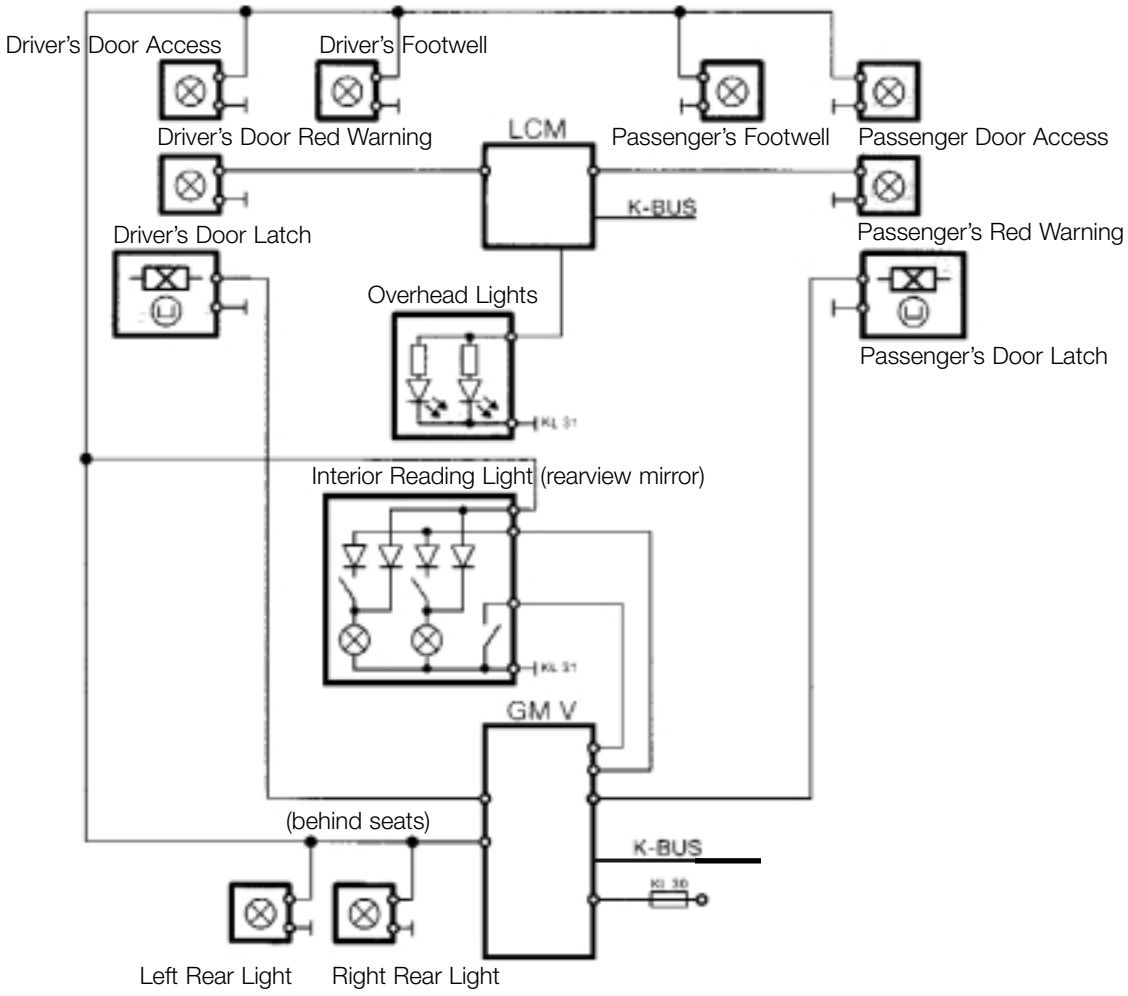
Purpose of the System

The GM controls the interior lighting automatically with the status change of several monitored inputs. The lighting can also be manually controlled using the interior light switch.

System Components

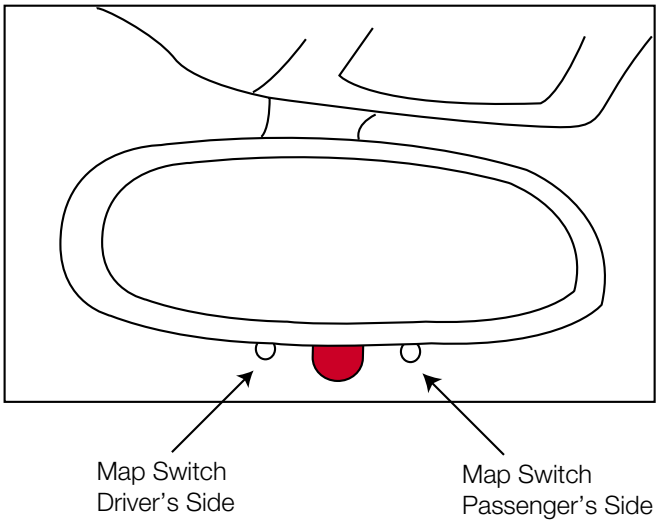
Door Contacts

As mentioned in the *Central Locking Section*, the door lock actuator contain a hall effect sensor for the purpose of monitoring door open/closed status (hall sensor 3 in the driver's door actuator). The hall effect sensor is located directly behind the rotary latch plate encased in the actuator. The sensor is activated by the rotary latch plate's position.
A change in current flow informs the General module when a door is opened or closed.



Interior/Map Light Unit

The overhead interior/map lights are contained in the rear view mirror, consisting of 2 lights. The lights are controlled by the GM automatically or by momentarily “twisting” the interior light switch (DWA indicator) located on the rear view mirror.



The switch provides a momentary ground signal that the GM recognizes as a request to either turn the lights on (if off) or turn the lights off (if on).

If the switch (DWA indicator) is held for more than 3 seconds, the GM interprets the continuous ground signal as a request to turn the interior light circuit off (workshop mode) as on previous systems.

The workshop mode is stored in memory and will not come back on even if the GM is removed from it's power supply and reconnected. The switch must be activated to turn the lights back on.

The lights can be used individually as reading/map lights. Each light is mechanically controlled by depressing it's corresponding on/off switch.

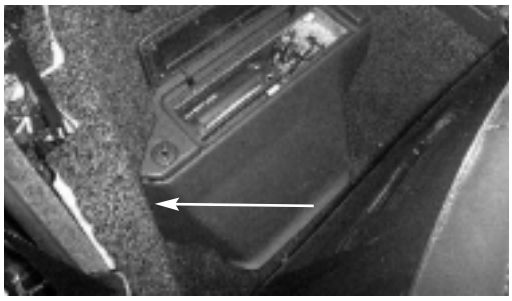
The power supply for the map lights is supplied by the GM through the Consumer Cut Off circuit.

Front Footwell Lights

In each front footwell, there is also a courtesy light. These lights are only operated when the GM provides power to the interior lighting circuit.

Rear Compartment Lights

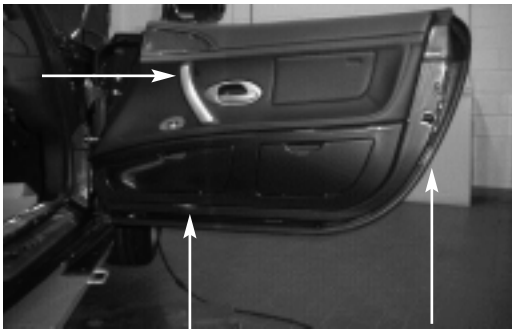
Lights are installed behind the seats to allow visibility for the Navigation/cd changer compartments.



Door Lighting

The doors are equipped with exit access lighting, as well as “red” safety lights when the doors are opened.

The inside door handles are back lit with an led.



Night Lights

The night lights are are located above the rear view mirror on the windshield frame. They provide a subtle illumination of the center console when the headlights are switched on.

Load Cutout Lights

The remaining lights can be switched on regardless of the ignition position:

- Reading lights
- Glovebox light
- Engine compartment lights
- Luggage compartment lights

The B+ power supply is provided by the GM V. To ensure against battery draw if the lights are left on, the GM V will deactivate the circuit 16 minutes after the ignition terminal “R” is switched off. The lights will be switched on again when ignition terminal “R” or “15” is switched on in addition to an input to the GM V - opening a door, hood, unlocking the door.

Automatic Control Function

The GM provides 12 volts (linear application providing soft on feature) to the interior lighting circuit when the one of the following input signal statuses change:

- Interior light switch
- Door contact hall sensor active (door opened)
- An Unlock request from the driver's door key lock hall sensors are received. This only occurs if the ignition switch is off.
- An Unlock request is from the FZV keyless entry system is received via the K bus. This only occurs if the ignition switch is off as well.
- The ignition switch is switched off (within 32 seconds) and the vehicle exterior lights (LCM) have been on for a minimum of 2 minutes prior. This information is provided to the GM via the K bus.
- Active crash signal from the MRS III control module.
- Lock button of FZV key is pressed with the vehicle is already locked (interior search function).

The GM gradually reduces the full 12 volt power supply (linear reduction providing soft off) until the lights are off when the following input signal statuses change:

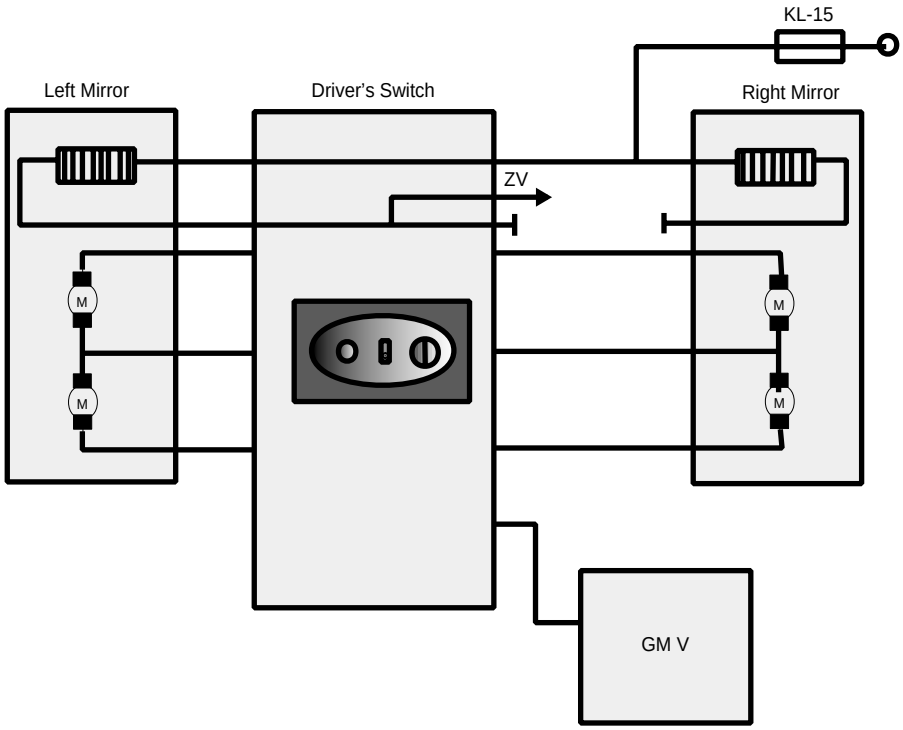
- Interior light switch
- Immediately after the ignition switch is turned to KL R with the driver's door hall sensor door contact closed.
- When the vehicle is locked (single or double) with the door contacts closed.
- When the vehicle door contacts are closed. The lights remain on for 20 seconds and then go to soft off.
- After the interior search function is activated, the lights will automatically turn off (soft off) after 8 seconds.
- After 16 minutes with a door contact active (open door) and the key off, the lights are switched off (consumer cutoff function).

Outside Mirror Adjustments

Purpose of the System

The outside mirrors can be electrically adjusted to a desired position. The Mirror adjust/window combination switch allows the driver to adjust the mirrors (up/down - left/right). This switch contains a slide switch that will “toggle” control from the left to right mirror.

The mirrors contain 2 motors and traditional heating elements . The Z8 does not have mirror memory, and the reverse gear input has no affect on the right mirror.



Remote RF (Keyless) Entry

Purpose of the System

The Z8 keyless entry system's operation is carried over from the E38/E39. A minor change ocuured with the location of the FZV receiver module location.

- The receiver is located in the interior rear view mirror.
- The receiver produces a digital signal based on the transmitter command and sends it to the GM for processing.
- The GM then carries out all remote lock features, window convenience opening feature and DWA arming/disarming functions.
- The frequency at which the key transmits the radio signal to the receiver is 315 MHz.
- The system is also used to convey the key being used to lock/unlock the vehicle.

System Components

FZV Key

- New appearance with blue and white BMW roundel.
- New button arrangement (larger buttons) with sequential operation (enhanced operating convenience)
- Rechargeable battery replaces replaceable batteries. Charged by EWS ring antenna.
- The key housing is encapsulated and can not be opened.
- The LED has been omitted.
- Key is used in Z8, E46, E38 and E39 vehicles.

Features of the keyless entry system include:

1. ARROW
Press once
•unlock driver's door
•DWA disarmed
•interior lights on

Press twice
•total unlocking

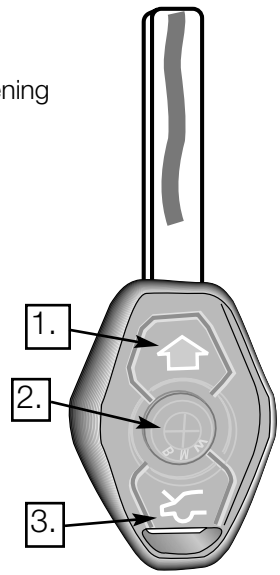
Hold
•convenience opening

2. ROUNDEL
Press once
•locking
•DWA arming
•interior lights on when vehicle locked

Press twice within 10s
•deactivate SDR and tilt monitoring

3. TRUNK
Momentarly press
•trunk lid opens

Press and hold
•panic mode alarm



- Up to 4 radio-control keys can be operated in conjunction with one vehicle.
- Locking/unlocking of doors, trunk, fuel filler lid.
- Selective unlocking of driver's door (as with key in lock).
- Arming/dis-arming of DWA alarm system.
- Remote unlocking of the trunk only.
- Comfort opening of windows
- Interior lighting activation (search mode).
- Panic mode alarm activation.

- Automatic correction for up to 1000 erroneous activation signals.
- Low transmitter battery fault code storage in the GM.
- An EEPROM is used to store the key data. The data is no longer lost when the bat tery is replaced and initialization is not required.
- Keys delivered with a four color label sheet containing four different colored labels for each of the four possible FZV keys.

FZV Key Rechargable Battery

From KL R, the battery inside the key head is charged inductively by the EWS ring antenna via a coil antenna integrated in the key. The charging process is controlled by electronic circuitry integrated in the key.

- The service life of a radio-control key used under normal conditions corresponds to the vehicle lifespan.
- If the FZV keys are not used (ie: stored in a drawer), the battery will be dicharged after approx. 1.5 years.
- The time required to fully charge a discharged battery is approx. 30 hours.
- The remote control can be operated about 15 times after a charging period of approx. 30 minutes (driving time).

The key data is stored in a transponder chip. The transponder chip is a wireless read and write EEPROM. It is powered via the ring coil at the steering lock. Power is applied electromagnetically when the key is in the ignition switch from KL R.

The power supply is used both for data transfer as well as for charging the battery. This has been made possible by new development of the transponder chip.

As with previous systems, every press of an FZV key also provides the battery charge condition. When the FZV electronics receives a low power condition message three successive times, the GM sets a fault indicating a low battery within a specific key.

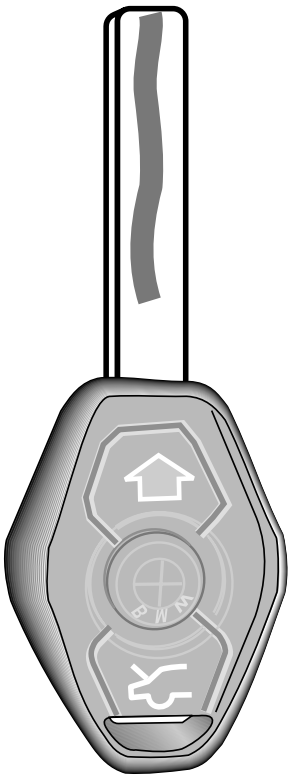
If the battery is recharged (used operate car), the fault will be automatically deleted when five successive messages are received indicating a charged battery condition. The new battery has no affect on the EWS III communication function!

Remote Key Initialization

The initialization of the FZV keys is required to establish the Lock/Unlock signal synchronization with the GM. The initialization procedure provides the GM with a key identification number and a “rolling code” for each key. If the initialization is not performed, the GM will not respond to the key signals.

Up to 4 remote keys can be initialized. They must be initialized at the same time. Key initialization is only possible with the vehicle unlocked.

Procedure:



1. Close all doors and have all keys available.
2. Using key number 1, turn the ignition switch to KLR, then switch off within 5 seconds and remove the first key.
3. Within 30 seconds of turning the ignition switch to “off” press and hold the arrow button.
4. While holding the arrow button, press and release “tap”) the roundel button three times within 10 seconds.
5. Release both buttons. The GM will immediately lock and unlock the doors signaling a successful initialization.
6. If additional keys need to be initialized repeat steps 3 - 5 within 30 seconds.
7. Switching the ignition to KL R completes the initialization.

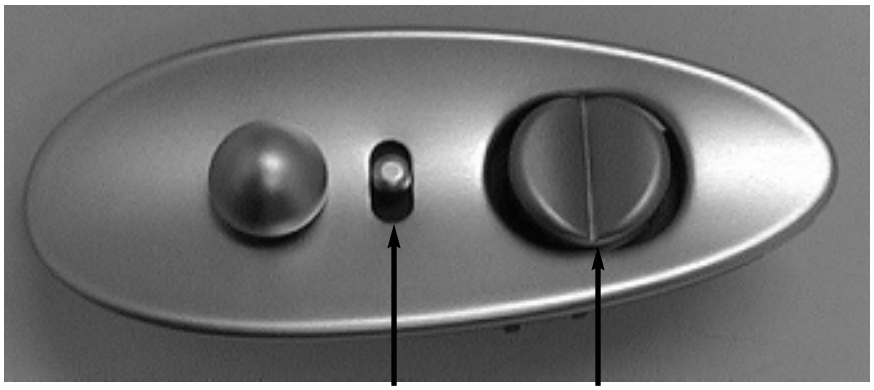
SERVICE NOTE:
The key memory function of the GM responds to the key identification number of each key. If the keys are not initialized in the same order prior to initialization, the key memory functions activated by the keys will not be assigned correctly. Always initialize the keys in the same order.

Power Windows

Purpose of the System

The Z8 power window is very unique. Features of the system operation includes:

- Control of the window motors is carried out directly by the GM.
- One-touch window operation in both directions (passenger side down only).
- Window lowering/raising when the doors are opened and closed.
- Cable type window regulators.
- Driver's side combination window/power mirror switch
- Convenience closing/opening of the windows from the driver's lock cylinder or convenience opening only from the FZV remote key
- Window operation with the ignition switched off until a door is opened or 16 minutes has elapsed after the key is switched off
- Window load switching is through relays integral of the GM. The GM V monitors the current draw for end limit position. The maximum run time for the window motors is limited to 8 seconds. This allows the motors to be switched off if the end limit load sensing fails.



Slide Switch Window Switch

New Style Window Switches

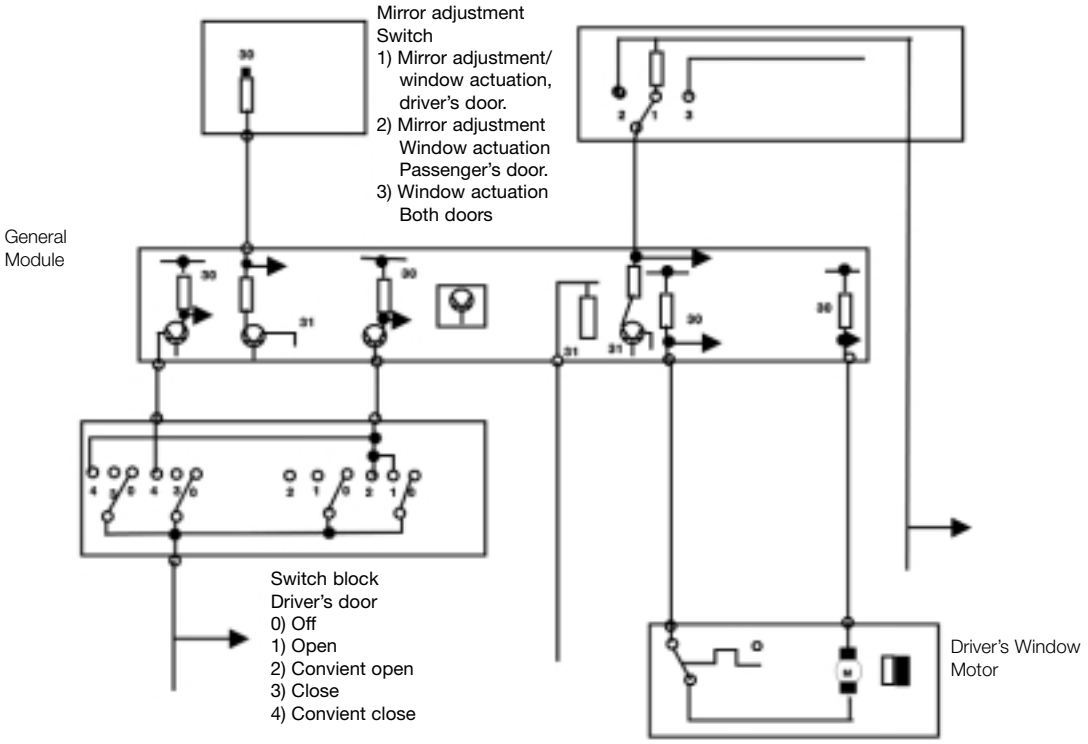
The Z8 power window switch design is a new rocker type switch. The switch provides the GM V with the familiar coded ground signaling strategy as previous two wire switches.

Pushing a switch to the first detent and holding provides a single ground signal on one wire requesting the GM to operate the window motor in the down direction. When released, the ground signal is removed and the window motor stops.

Momentarily pushing the switch to the second detent and releasing provides an additional ground signal on the second wire requesting the “one touch mode”, operating the window motor automatically. The motor runs the window down until it reaches it's end stop.

The switch functions in the same manner for the upward run of the window motor (driver side only)but the ground signal sequencing is reversed.

The drivers side switch block contains a slide switch for the mirrors, this also affects the windows. If the slide switch is set to the left, the left window will be controlled. If the slide switch is set to the right, the right window will be controlled. If the slide switch is set to the middle position, both windows will be controlled from the driver’s window switch.



Power Window Motors

The window motors are mounted on the cable regulators. The window motor control circuit consists of two wires for operating the motor in both directions.

The motors are activated by relays in the GM. The relays provide either power or ground depending on the direction of window travel.

The GM controls the polarity of the based on a request to run the window (window switch, Convenience Opening/Closing).

The windows are run to their limit stops which is detected by an amperage increase in the control circuit. Additionally, the window run cycle is limited to an 8 second duration if in case the amperage increase is not detected or there is a malfunction with the regulator.

Window Motor Limit Stop Function

If the repetitive window activation (up/down) exceeds one minute, the GM deactivates the internal relays and disregards any further input requests. The GM provides motor activation after a short duration but not for the full one minute monitoring cycle.

Over time, the GM slowly reverses the stored count of activation until the stored number equals 0.

Electronic Steering Lock (ELV)

Purpose of the System

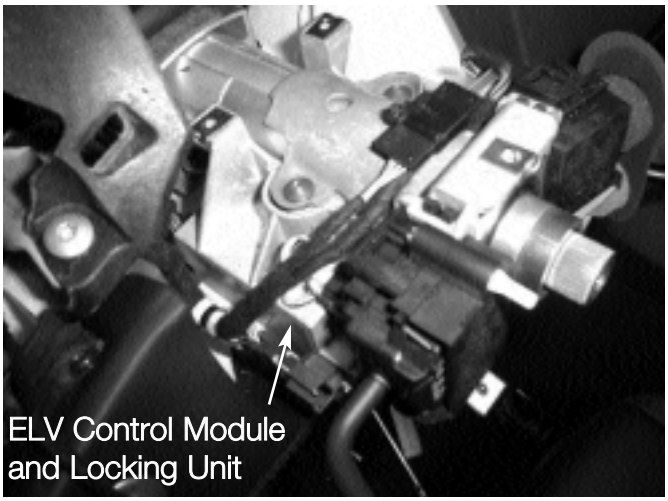
On historical cars and race cars the starter has a remote button separate from the ignition switch.

In the Z8, this operating concept has been enhanced by the latest technology in the form of the electronic steering lock system (ELV).

The advantages of this system are that the steering lock and ignition switch can be relocated in a safe location (security), the starter button is located in an ergonomically optimum position for the driver, and the steering column lock is released by EWS recognition.

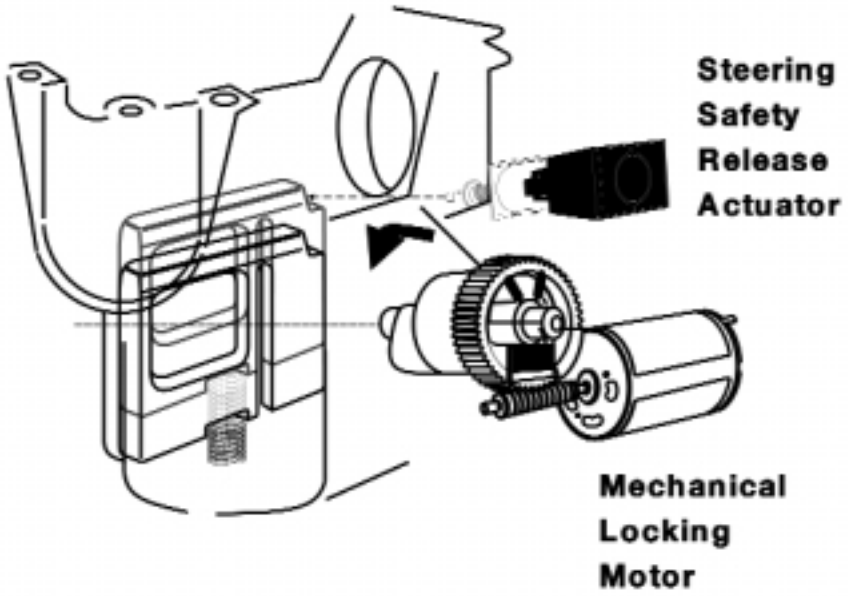
System Components

The ELV unit is mounted on the steering column as shown to the right. It is secured with sheer bolts, and is not serviceable. The ELV must be replaced as a unit



The ELV assembly contains the control module and steering lock mechanism.

The steering lock consist of the mechanical locking motor to engage or release the locking plate, and the safety release actuator (solenoid) to maintain the locking plate position in the event of power loss during operation.



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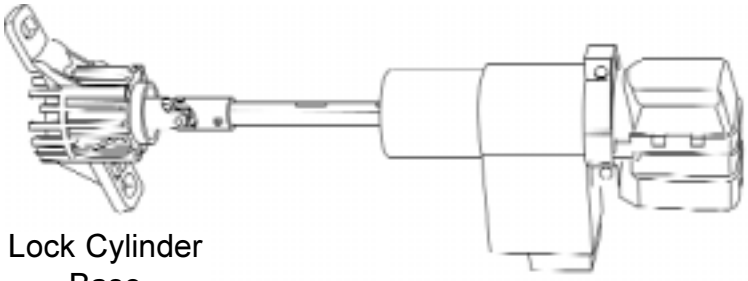
System Components

The ignition switch assembly shown on the right allows for “remote” mounting of the switch which is a further deterent for tampering.



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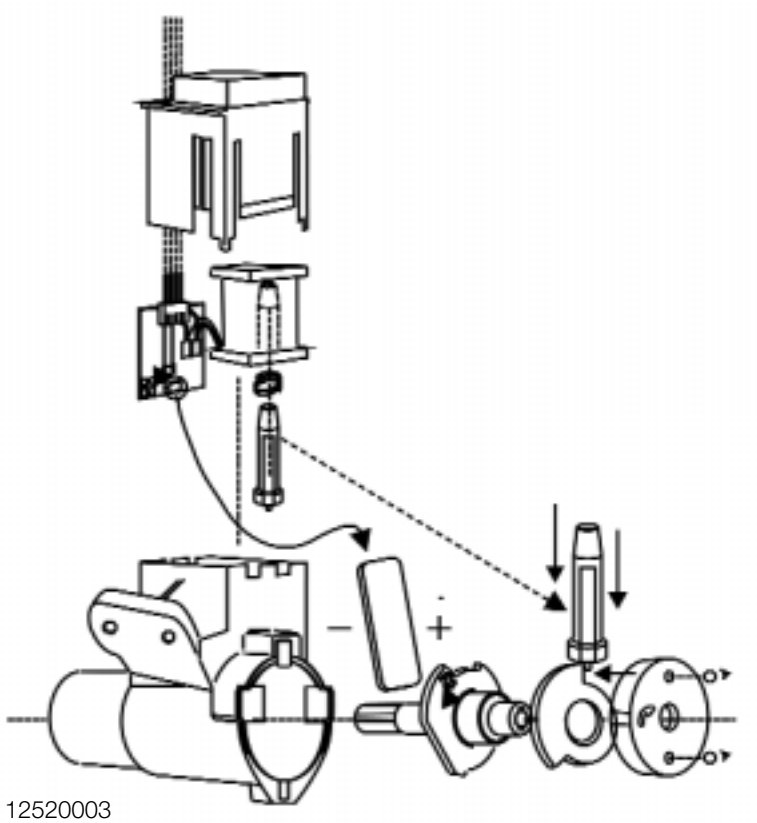
The ignition switch consist of a “turn catch” actuator (solenoid) which prevents turning of the ignition switch unless EWS recogniton has taken place.

The rotating plate in the switch is monitored by a Hall sensor (rotation recognition). This input is used by the ELV for a plausibility check in conjunction with KL R and KL 15.



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System Operation

To unlock/start:

- Key check conducted by EWS via K-bus
- Steering release aided by an actuator (key near antenna ring)
- Mechanical locking (locking motor)
- Rotary lock released (in ignition switch)
- Start enable signal to EWS

To lock:

- Terminal 15, R, and ignition switch rotation recognition check
- Speed signal check (from left rear wheel - must not be present)
- Interrupt relay is deactivated

Special functions:

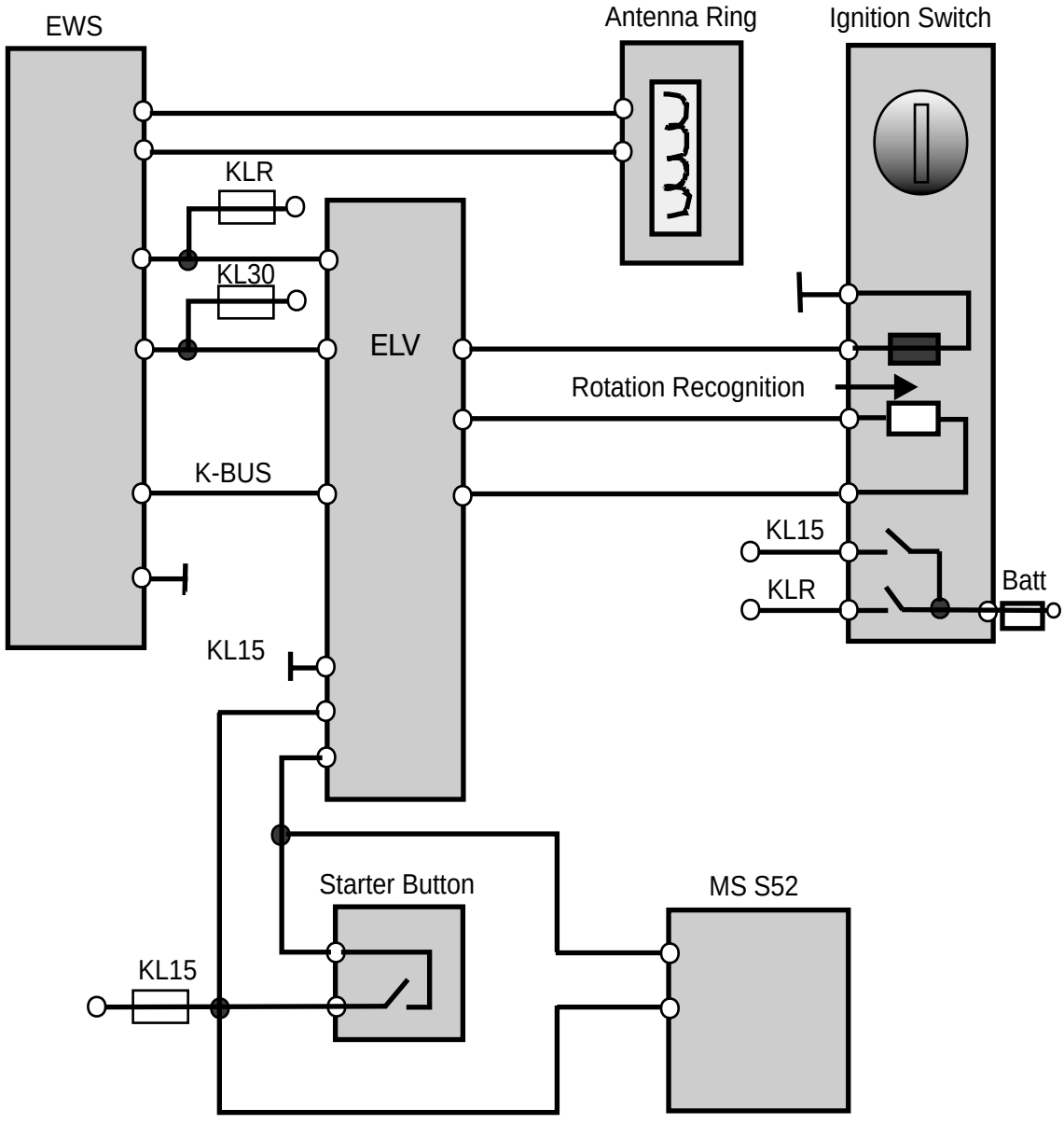
- Emergency functions in the event of K-bus defect
- Overload cutout for actuator
- Sleep mode
- Crash mode (lock released)

Diagnosis/encoding:

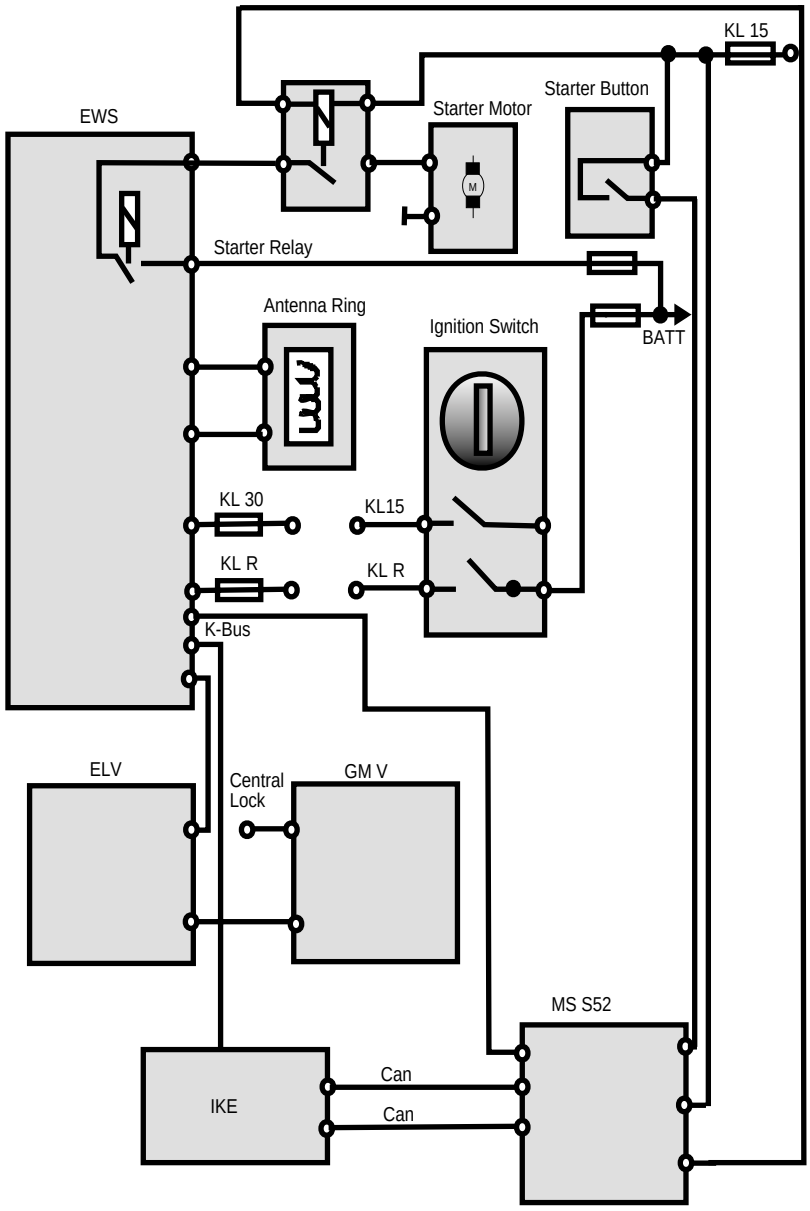
- Coding function after replacement of ELV unit
- Fault code memory
- Status check of all outputs and inputs
- Diagnosis

System Diagram

ELV Block Diagram



ELV Link Diagram



The Z8 EWS 3.3 is the similar to previous BMW models. All of the familiar EWS 3.3 features carry over to the Z8.

The additional features in the Z8 are the remote starter button and the *ELV steering lock*.

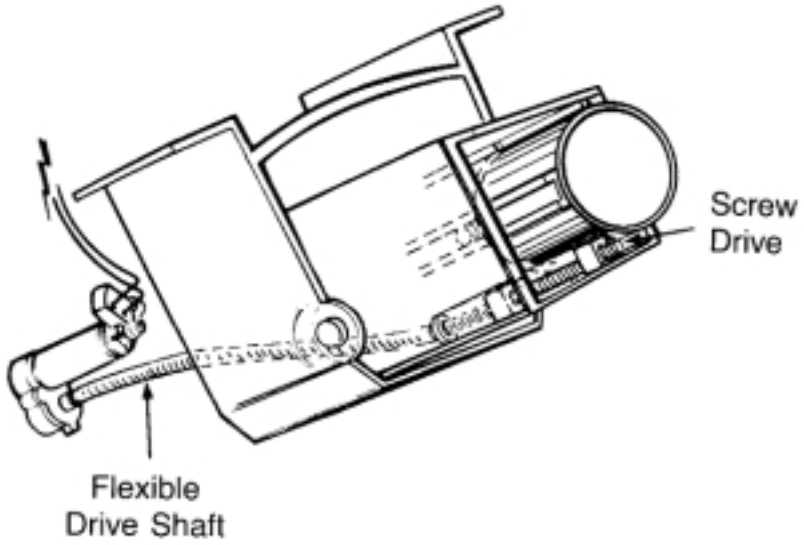
Electrically Adjustable Steering Column

The steering column can be adjusted for telescopic (inward/outward) postion.

This is accomplished electrically as previously seen on other BMW models.

The electric column in the Z8 does not have a memory feature.

The telescopic column rocker switch is located on the underside of the steering column.



Multiple Restrain System - MRS III

Purpose of the System

The Z8 is equipped with the Multiple Restraint System (MRS III) which employs the use of “SMART” technology. Smart technology refers to the control module’s programming which allows for the deployment of the airbags, in stages, depending on the severity of the impact. Two stage airbags are used for both the driver and passenger which allows for a softer cushioning effect when the bags are triggered at lighter impacts.

MRS III control modules are manufactured by either Bosch or Temic. While the functional operation of both modules are the same. The control modules are not interchangeable from a replacement standpoint. Always refer to the EPC parts system to ensure that the proper module is installed in the vehicle.

In addition to the use of two stage airbags for the driver and passenger, the following features are also included in the MRS III system:

- The MRS III control module is linked to the K-Bus for coding and diagnosis.
- The MRS III includes a fuel pump cut off feature in the event of an airbag deployment.
- Inert gas generators are now used for all air bags and seat belt tensioners.
- The inert gas is a mixture of hydrogen (13.5%) and oxygen (86.5%).

System Component

MRS III Control Module

The control module is mounted in the center console area on the driveshaft tunnel.

The control module contains the processing electronics (Smart Technology) for triggering of all air bags and pyrotechnic devices installed in the vehicle.

Two electronic deceleration sensors are installed in the module for crash or impact detection.

Satelite Sensors

The satellite sensors are mounted behind the driver's and passenger's seats underneath the Navigation and cd storage compartments. The function of the sensors is to detect the severity of side impacts and signal the MRS III control module, through a pulse modulated signal, in the event of a crash. The control module uses this input signal along with its internal impact sensor signal to determine the deployment of the side/head airbags.

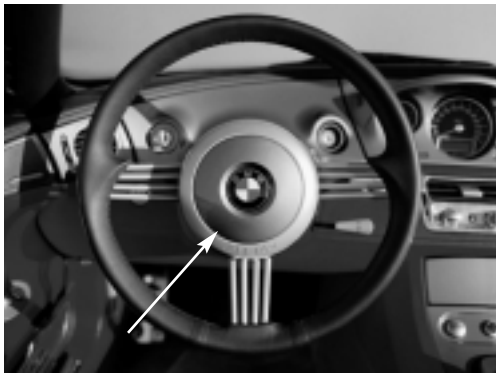
As with the control modules, the satellite sensors are manufacturer specific. The Temic sensors have a three wire connector which will not interchange with the Bosch sensors. Only two of the wires are used for the satellite sensor's operation. The signal for deployment of the bags is carried over the power wire of the sensor.

Driver's Front Air Bag

With the MRS III system, the driver's front airbag becomes a two stage bag similar to the passenger's front side bag, introduced on the 1999 model E38/E39s. The complete assembly is mounted beneath the cover in the center of the steering wheel as with previous airbags. The assembly now contains the inert gas generator chamber and two ignition stages (ignitors).

The airbag consists of:

- Accumulator/gas generator
- Two ignition capsules
- Propellant gas - 13.5% hydrogen
  86.5% oxygen



To remove the airbag - compress the spring latches through the two access holes (at the bag base, next to the steering wheel spokes).

Passenger's Front Air Bag

The passenger's front airbag is the same unit as installed on E38/E39 vehicles as of 9/98 production.

The passenger's airbag consists of:

- Pressure accumulator/gas generator
- Two ignition capsules - for two stage activation
- Propellant gas of - 13.5% hydrogen
  86.5% oxygen

Side Air Bags (Thorax)

The side airbags continue to be mounted in the door panels on the doors. Deployment of the side airbags is dependent on the triggering thresholds pro grammed in the MRS III control module, based on the inputs from the satellite sensors and internal crash sensor. The side airbags use the same cold gas inflation method as the driver's and passenger's front bags.

System Operation

As with previous systems, the triggering thresholds are programmed in the MRS III control module. These thresholds are determined by BMW through crash and vehicle testing during the design and development of the vehicle. These thresholds will vary depending on the vehicle size and design.

There are several different thresholds for airbag and safety restraint deployment including:

- Belt pre-tensioner threshold for activation of the seat belt tensioners.
- *Airbag threshold #1* - the first level of activation for the two stage front airbags, always deployed first when the front triggering threshold is reached.
- *Airbag threshold #2* - the second level of the two stage front airbags, can be deployed simultaneously or after a time delay, depending on the severity of the impact.
- *Rear crash threshold* - for activation of the seatbelt tensioners with a rear impact.
- *Battery safety terminal threshold* - for activation of the BST with airbag deployment.
- *Side airbag threshold* - for deployment of the side (thorax) airbags.

Triggering Thresholds - Two Stage Air Bags

The programming of the MRS III includes four triggering thresholds for the two stage front airbags. The triggering of the front airbags is also dependent on whether the seat belts are connected and if the front passenger seat is occupied.

Threshold	No Seat Belt	Belted
1	Ignition Stage 1	No Activation
2	Ignition Stage 1&2	Ignition Stage 1
3	Ignition Stage 1&2	Ignition Stage 1&2
4	Ignition Stage 1&2 Simultaneously	Ignition Stage 1&2 Simultaneously

- If the signal from the SBE is defective on triggering, the MRS III will deploy as if the seat is occupied.
- If the signal from the seat belt contacts are defective, the MRS III will deploy as if the belts were not buckled.

Triggering Threshold - Side Air Bags

The triggering thresholds for the side airbags is dependent on the signals from the satellite sensors and the crash sensor in the MRS III control module. The triggering thresholds are independent of the belt tensioners.

Triggering Threshold - Belt Tensioner

The triggering of the belt tensioners is dependent on the signal from the seat belt contact and the severity of the impact as detected by the control module.

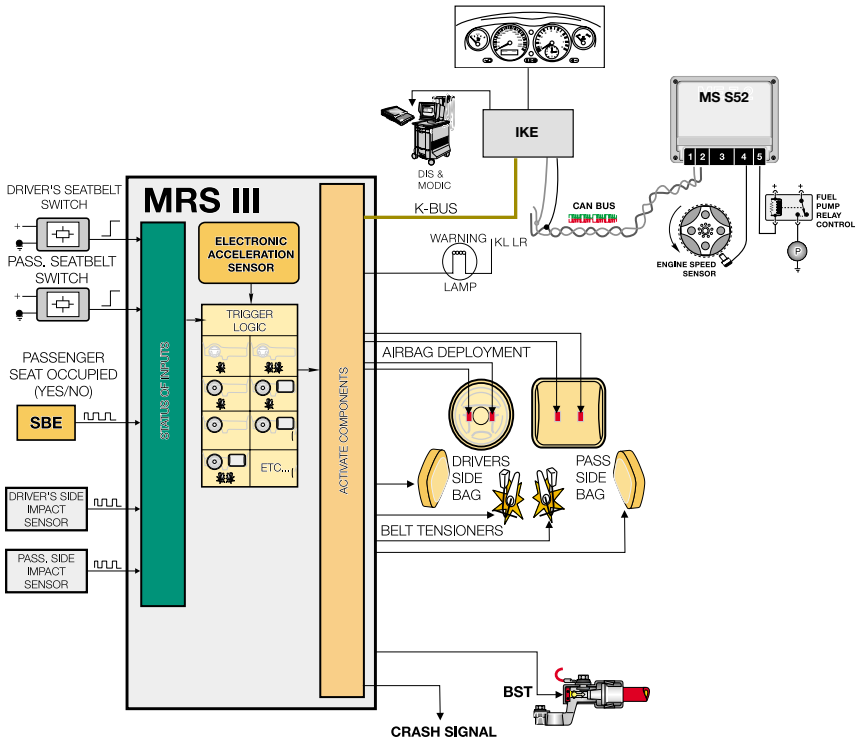
Triggering Threshold - Battery Safety Terminal

The BST will deploy in a frontal impact at threshold 2 or greater. The threshold for BST activation with a side impact is programmed separately in the side deployment criteria. The BST will also be deployed when the rear impact threshold is exceeded.

Triggering Threshold - Fuel Pump Shut Down

New to the MRS III system is the link via the K-Bus/CAN Bus to the Engine Control Module for deactivation of the fuel pump. The MRS III will signal the DME over the K-Bus through the IKE and CAN Bus to shut off the fuel pump in the event that any crash threshold is exceeded.

System Diagram



Diagnosis

Diagnosis and troubleshooting of the MRS III system is fault driven and can be accessed using the DIS Tester or MoDiC. The control module performs a self test of the system every time the ignition is switched on (this includes the satellite sensors and seat occupancy sensor). Any faults with the system will cause the warning lamp in the instrument cluster to remain illuminated after the engine is started.

Installation of a new or replacement control module requires ZCS coding also using the DIS or MoDiC.

When servicing or replacing any MRS III components, always follow precautionary measures outlined in the repair manual of TIS. this includes disconnecting the battery prior to any repair or maintenance work being performed.

All airbag components are part number specific by model and require verification in the EPC to ensure the correct component is being installed.

Light Technology

Purpose of The System

As a technical innovation in addition to the classic appearance, neon light technology is used in the Z8 for the external light systems. Neon light technology is used for the direction indicator, brake light and reversing light functions.

Neon tubes are used in the tail lights and direction indicator lights instead of light bulbs. The neon tubes are activated by means of special ignition control units controlled by the LCM.

Fiber optic technology is used for the side indicator lamps (same principle as E38 entrance area lighting).

The remaining vehicle light systems in the Z8 use the xenon light for the low beam headlight and halogen light for the high beam headlight.

As on other new BMW models, all light functions are controlled by a central light control unit (LCM). Car memory allows Day time and “follow me home” lighting (pull the high beam stalk back briefly).

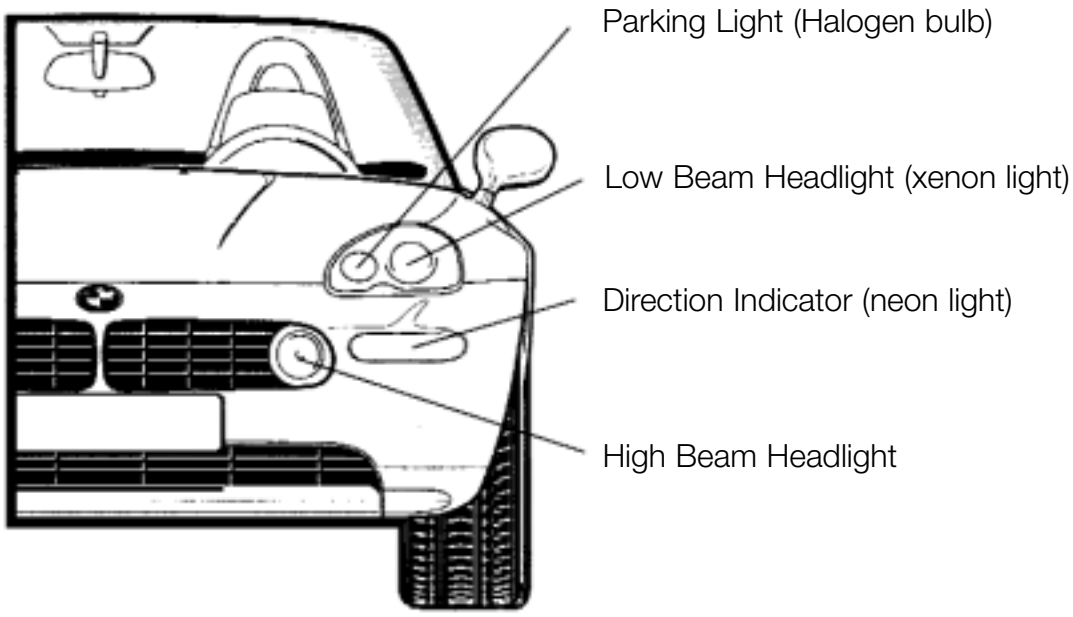
Operating Data

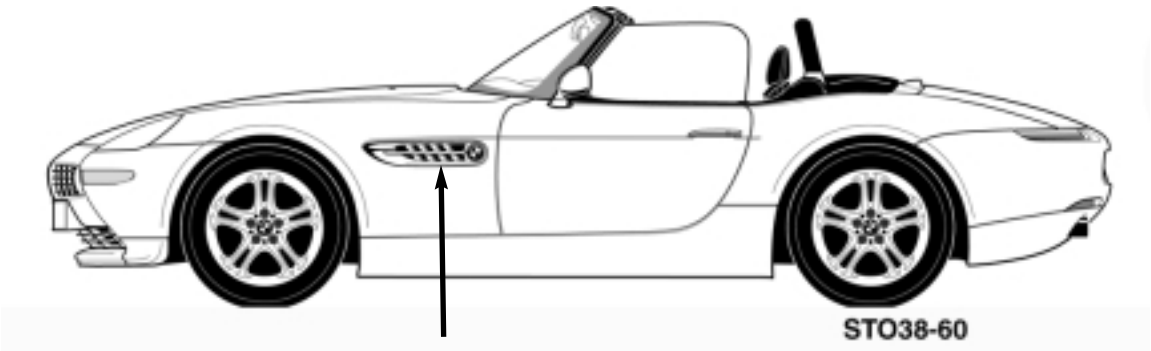
TYPE	POWER	VOLTAGE	CURRENT	FREQUENCY	IGNITION
Front Direction Indicator	45W	1000V	50mA	14.5kHz	10,000 V
Rear Direction Indicator	25W	1000V	50 mA	14.5kHz	10,000V
Central Brake Light	8W	620V	12 mA	22.0kHz	1,800V
Brake Light	20W	750V	24 mA	33.0 kHz	6,000V
Backup Light	2W (power-reduced brake light)				

System Components

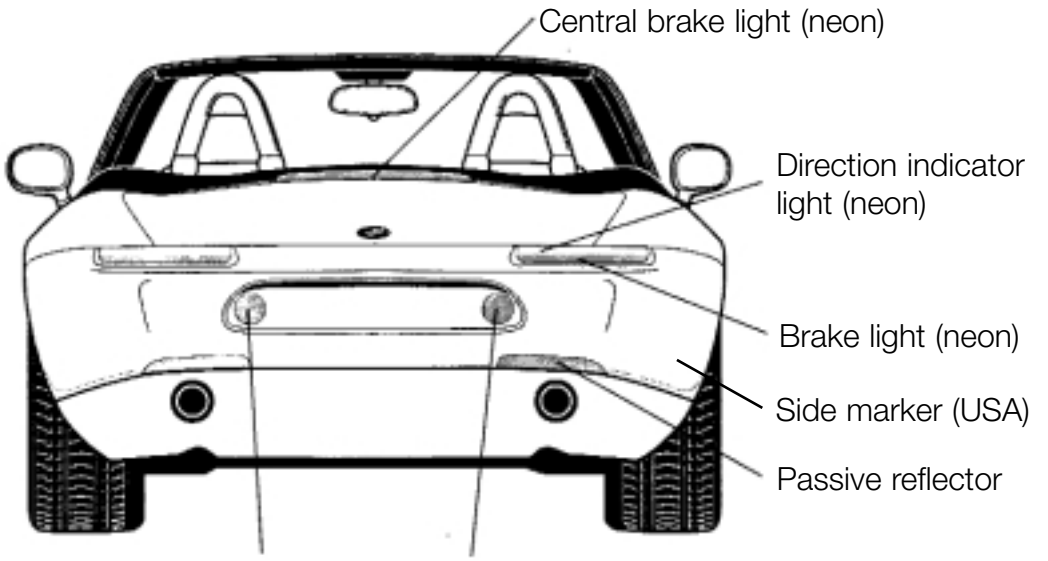
Front Direction Indicator Lights

Used as side markers, the direction indicator lights are continuously operated with 5 W (watts) when the lights are switched on (including parking light). When active, the direction indicator lights are alternately powered 5 W and 45 W.





Side direction indicator light (fiber optics technology)



Rear Direction Indicators

These lights are red. They have the dual function of direction indicators and stop lights. The outer brake lights also have the dual function of direction indicators and stop lights.

The dual function is used when braking with the direction indicators active.

- Direction indicator and hazard lights have priority over brake lights.
- The light monitoring (LCM) has been extended to incorporate the outer brake lights.

Note: Neon light fault codes can be read out from the LCM via the DIS/MoDIC.

Neon Technology

Background

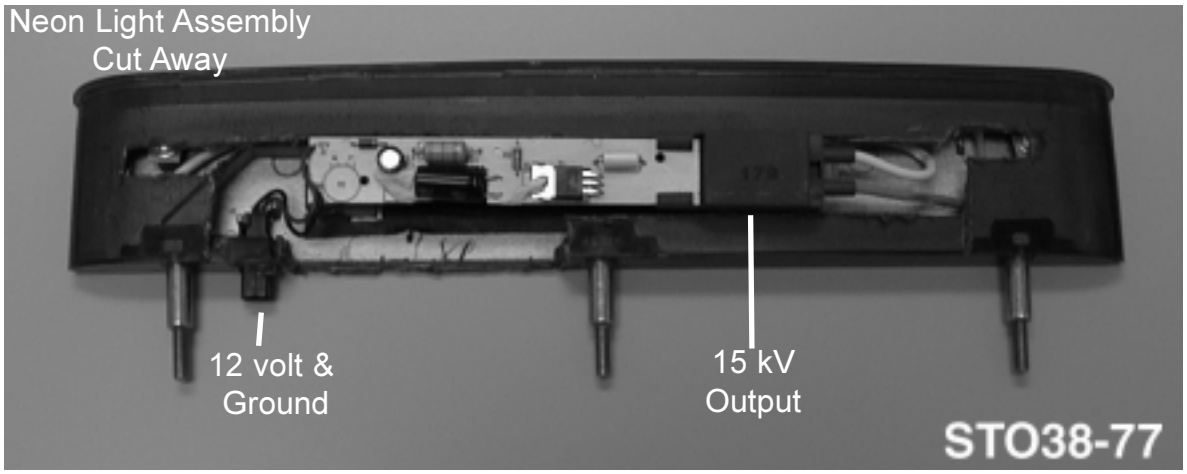
Neon (symbol Ne) produces a glow in a vacuum electric-discharge tube and is used extensively in the familiar advertising displays.

A neon light is a glass bulb or tube containing neon (gasseous element) at low pressure, and two metallic electrodes. To make a neon light, the tube is bent while warmed, to the desired shape and sealed at both ends. During the sealing process, electrodes are added at each end. An access port is left near one end and a vacuum is applied to the interior of the tube. After the air and humidity has been removed, the neon gas is added under low pressure and the tube is sealed.

The light produces a reddish-orange glow when an electric current (applied across the electrodes) is raised in voltage to the point at which it ionizes the gas in the tube. The voltage at which the light glows varies with the design of the tube. When the glass tube is ionized, the voltage drop across the tube is constant, regardless of the amount of current flowing through the tube. The neon glows with an even intensity throughout the length of the tube.

A variant of this is the glass tube containing ionized neon at very low pressure. The tube shines with a brilliant red glow if a high-voltage alternating current is applied to the electrodes sealed in the ends of the tube.

With chemistry and electrical changes, neon lights can produce an amber color. This allows the application for front turning/parking lights.



Neon Technology

Neon Benefits

The use of neon lighting provides several advantages to automobile manufacturers and consumers:

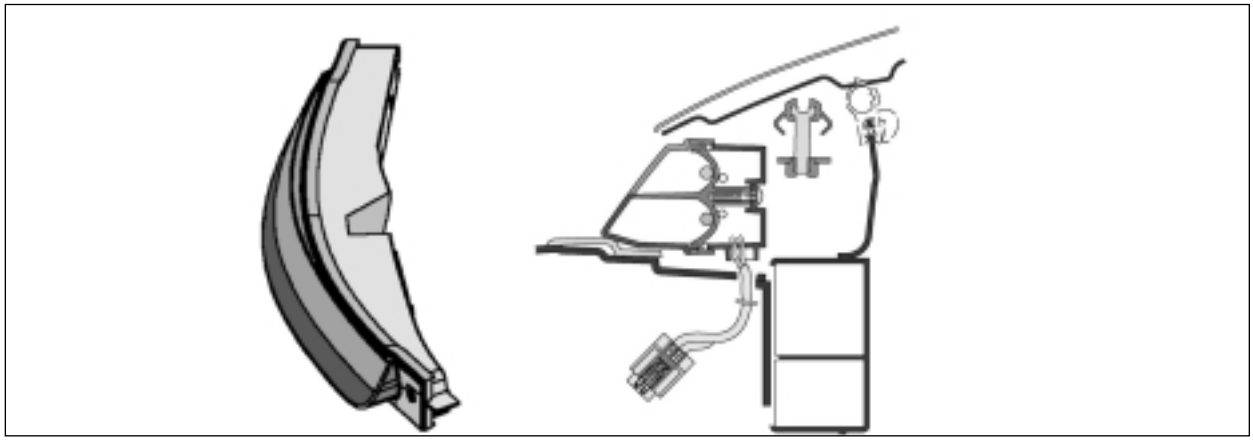
* Light failures caused by shock and vibration are minimized, because neon operates without a filament.

* The average life of the light is considerably higher as compared to incandescent bulbs.

* Styling of the light includes a more uniform distribution of light across the lense, and neon tubes can be bent to conform to the contour of the vehicle.

* Amber neon allows the use of a clear lense (for vehicle color schemes).

* Neon enhances safety because of the extremely fast ignition time of the light (instantaneous braking signal), allowing other drivers more time to react.



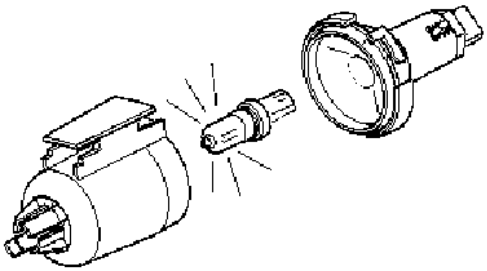
The neon lights are activated directly by the LCM. The neon tubes have ignition control units on each housing.

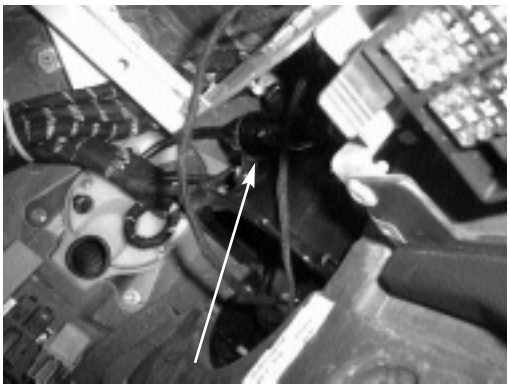
Note: Due to extremely high internal voltage, internal testing is not permitted. Please refer to the repair information before testing or servicing.

Side Direction Indicator - Fiber Optics

The side directional indicator lighting is provided by halogen bulb light sources in each base of the “A” pillars, and fiber optic tubing. The light sources are controlled directly by the LCM, when the directional signal is activated.

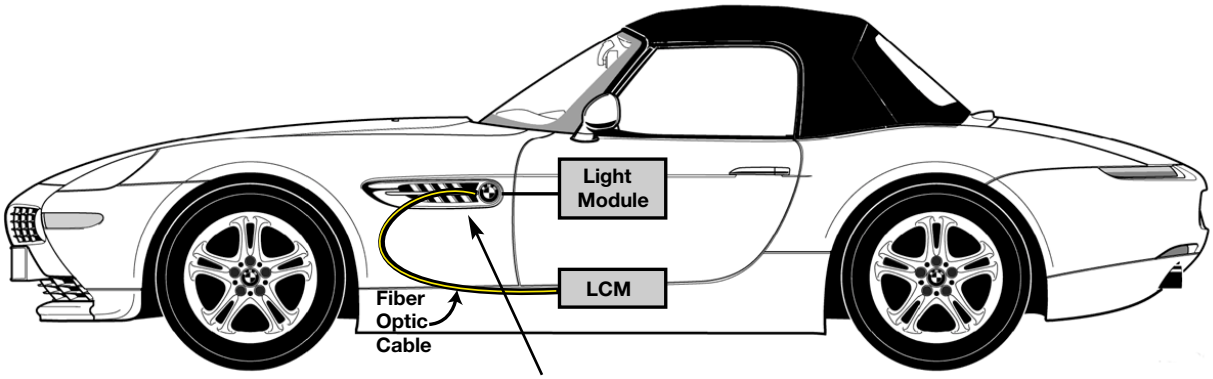
Light Source Modules: Mounted in each “A” pillar base, behind the lower dash trim, are the light source modules. The light source modules are made up of the housing, halogen bulb and reflector.





The reflector holds the bulb and focus the bulbs light into the housing. The bulbs are are available for individual replacement (P/N 63 31 8 371 610).

Fiber Optic Light Conductor Cable: The fiber optic cables carry the light to their respective light housing in each front fender (through the engine compartment bulkhead).



Side Direction Indicator Light (Fiber Optic Technology

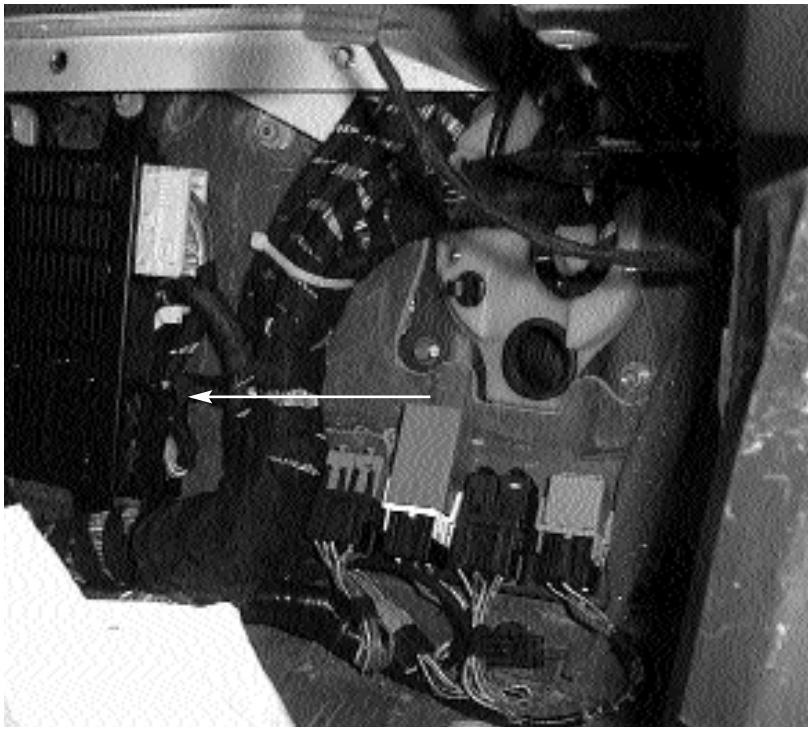
Installation note: the bending radius of the fiber optic cable should be less than 20mm when installing.

Light Control Module - LCM

The neon and fiber optic lights are directly activated by the LCM.

The LCM is located behind the carpet and protection plate on the passenger's side, below the glovebox.

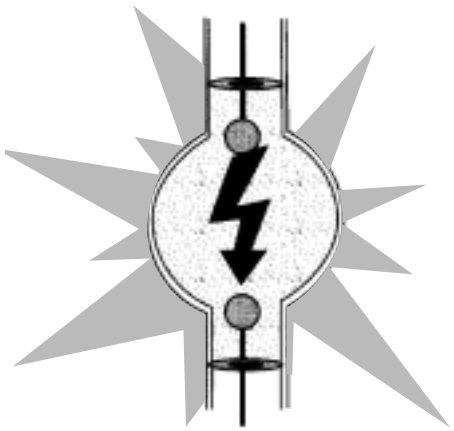
The LCM is diagnoseable via DIS/MoDIC, and requires coding when replaced (refer to IKE section).



Xenon Lights

- The automotive industry/press often identify xenon lighting systems as HID (high intensity discharge) systems. Xenon headlight technology was first introduced to the US market exclusively on the E32 750iL in 1993. BMW xenon headlight systems have evolved and their availability as optional equipment has spread through out the model lineup.

- Blue/White in color and using ellipsoidal technology Xenon headlights pro vide improved night time visibility in all driving conditions compared with traditional Halogen bulb headlights.



Xenon High Intensity Discharge Bulbs

- Xenon bulbs are identified as D2S(D=Discharge). Xenon bulbs illuminate when an arc of electrical current is established between two electrodes in the bulb.
- The xenon gas sealed in the bulb reacts to the electrical excitation and heat generated by the current flow. The distinct bluish/white brilliant light is the result of the xenon gas reacting to the controlled current flow.

Phases of Bulb Operation

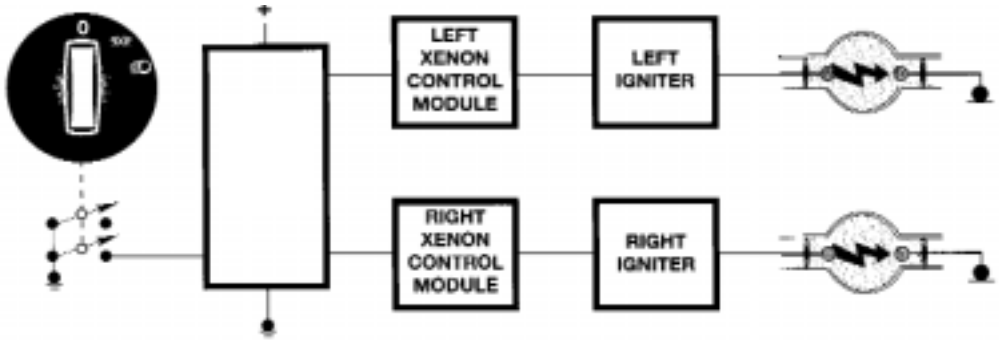
Starting Phase: The bulb requires an initial high voltage starting pulse of 18-25kV to establish the arc.

Warm Up Phase: Once the arc is established the power supply to the bulb is regulated to 2.6A generating a lamp output of 75 watts. This is the period of operation where the xenon gas begins to brightly illuminate. The warm up phase stabilizes the environment in the bulb ensuring continual current flow across the electrodes.

Continuous Phase: Once the warm up phase is completed, the system switches to a continuous mode of operation. The supply voltage for the bulb is reduced and the operating power required for continual bulb illumination is reduced to 35 watts which is less than a conventional halogen bulb.

Functional Description

- To regulate the power supply to the bulbs, additional components are required. The xenon control modules (1 per light) receive operating power from the lighting control module (LCM) when the headlights are switched on. The xenon control modules provide the regulated power supply to illuminate the bulbs through their phases of operation.
- The igniters establish the electric arcs. Integral coils generate the initial high voltage starting pulses from the control module provided starting voltage. Thereafter they provide a closed circuit for the regulated power output from the control modules.



Xenon Bulb Monitoring

- Xenon bulb function is monitored by the Lighting Control Module (LCM). The bulbs are only “hot” monitored. Cold monitoring is not possible since the lighting control module is not in direct control of the xenon bulb. For this reason cold moni toring for low beam headlights is encoded off in the lighting control module for Xenon headlight equipped vehicle.
- The lighting control module detects xenon bulb failure via a reduction in current flow to the xenon control module. When a bulb fails, the xenon control module’s current consumption drops to 60mA indicating unsuccessful xenon bulb illumination. The lighting control module then posts the appropriate display message.

Diagnosis

- Xenon control modules are not connected to the diagnostic link. However, the vehicle specific Lighting Control Module (LCM) does incorporate xenon headlight specific diagnosis up to the xenon control module.

Xenon Headlight Testing

Warning: *Xenon headlight control systems generate high output voltage. Prior to headlight removal or testing observe the vehicle warning labels and be cautious by following safeguards to prevent accidental injury.*

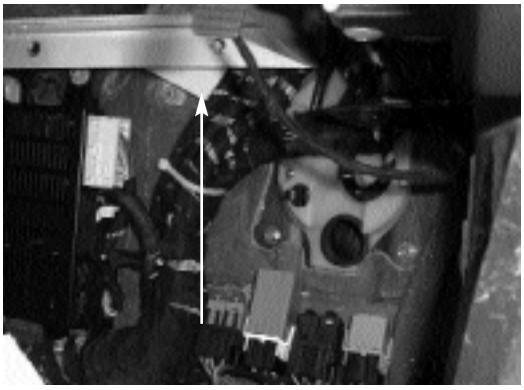
Refer to SI 04 33 96 for detailed adapter introductory information.

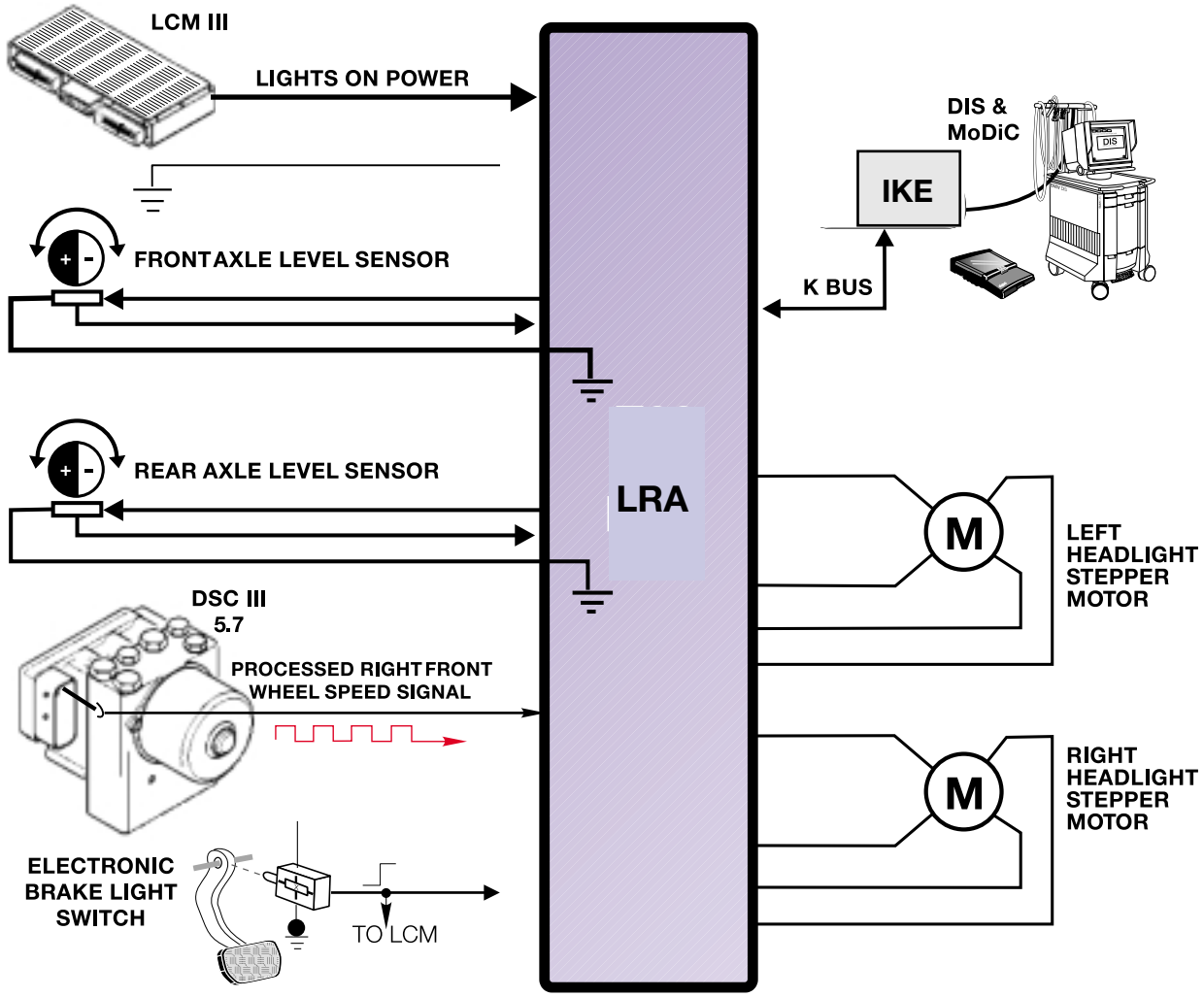
Headlight Beam Throw Control - LRA

- LRA automatically adjusts the vertical positioning of the headlights to maintain optimum headlight beam positioning for maximum driving visibility and to prevent undue glare for oncoming motorists. The system compensates for vehicle load angle changes (ie: diminishing reserve of gasoline in fuel tank during a long journey, over loaded cargo weight, etc.)
- LRA has been available on BMW vehicles (refered to as LWR) in other markets for quite some time. Starting with the 1999 model year all US market vehicles with Xenon Lights incorporate LWR as standard equipment, now included in the new Z8 (refer to 1999 Model Update for specifics).
- LRA monitors the vehicle's loaded angle via two hall effect sensors mounted to the front and rear suspension members. When an adjustment is necessary, LRA simultaneously activates two stepper motors (one in each headlight assembly).
- The stepper motors drive a threaded rod that moves the lower edge of the headlight carrier plate forward and backward (depending on driven direction). The upper edge of the headlight carrier plate is fixed on a pivot. The pivoting movement adjusts the vertical position of the headlight beam.

Control Module

The LRA control module is located behind the glovebox. The control module connects to a single, harness connector. The control module has diagnostic capabilities and communicates with the DIS/MoDiC via the K bus - IKE gateway to the D bus.




LCM III
LIGHTS ON POWER
DIS &
MoDiC
IKE
K BUS
FRONT AXLE LEVEL SENSOR
REAR AXLE LEVEL SENSOR
LRA
M
LEFT
HEADLIGHT
STEPPER
MOTOR
DSC III
5.7
PROCESSED RIGHT FRONT
WHEEL SPEED SIGNAL
M
RIGHT
HEADLIGHT
STEPPER
MOTOR
ELECTRONIC
BRAKE LIGHT
SWITCH
TO LCM

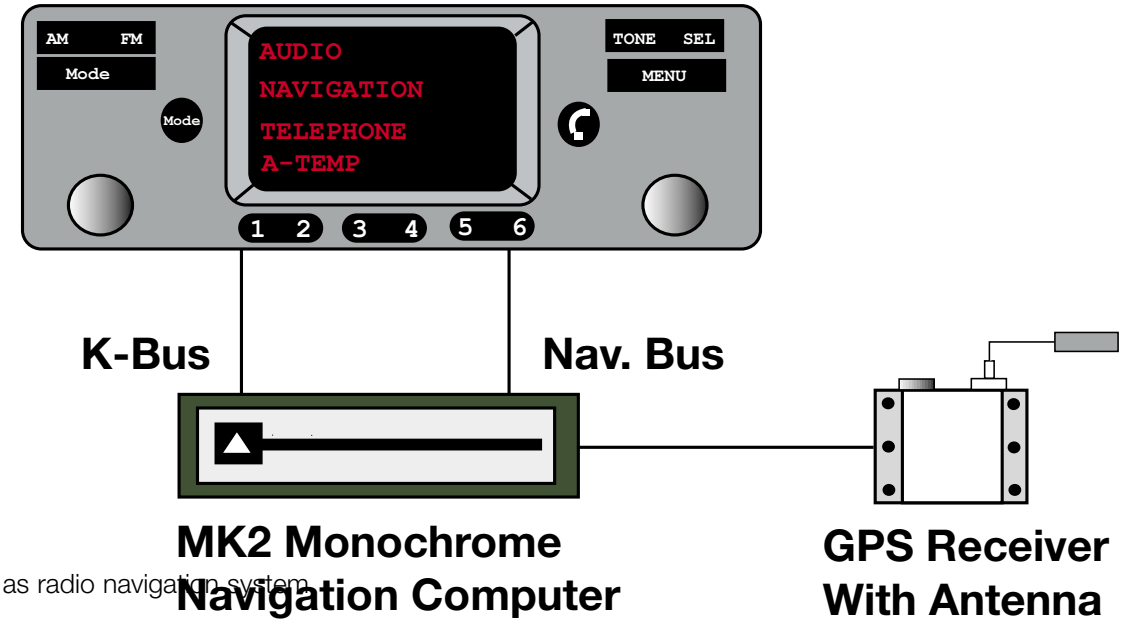
Multi-Informration Radio System (MIR)

Purpose of the System

This audio set is the first of the New Generation Radio family. The multi-information radio will be installed for the first time in the Z8. The standard equipment includes a CD changer together with a Harman Kardon HiFi system. The MIR in the Z8 does not have cassette player.

Audio mixing makes it possible to simultaneously listen to music and obtain navigation information.

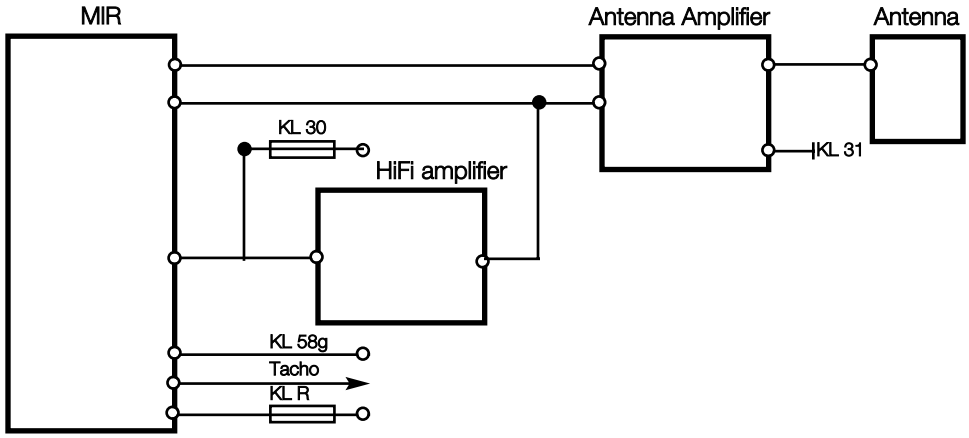
The outside temperature display (warning) is the only BC function that can be called up in the MIR of the Z8. Country-specific variants are set by coding. Please review aftersales publications for details and operation.



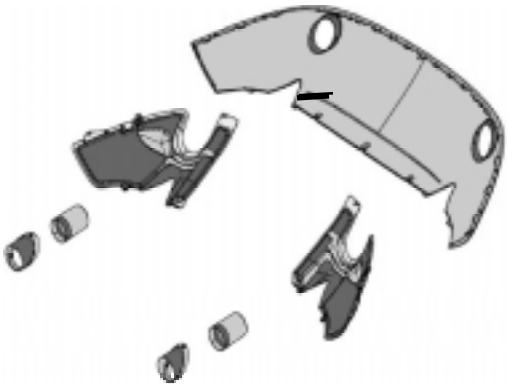
MIR as radio navigation system

System Components

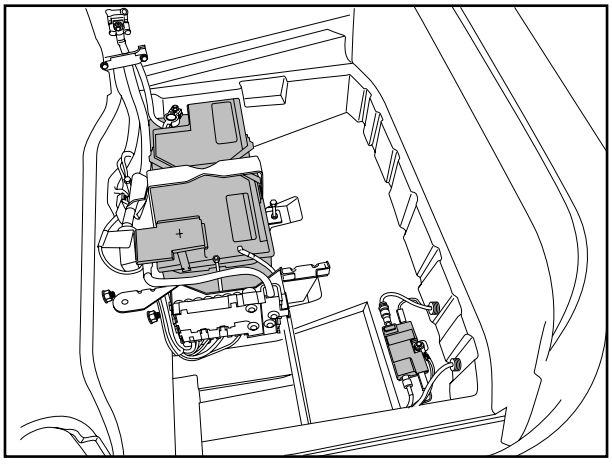
Block diagram of **rear bumper antenna**



The AM/FM antenna located in the rear bum



The antenna amplifier located on the trunk floor



Review Questions

1. What features of the power windows can the FZV operate?

2. The IKE shares “backup” information with what other module?

3. Can you name the different buses in the Z8?

4. If the battery is dead, how can the trunk be opened?

5. Where does the “door closed” signal come from?

6. What controls the “red” doorlights and when do they illuminate?

7. If the hazard lights are activated what light illuminates when the brakes are applied?

8. What control module is the diagnostic gateway to the ZKE?

9. Identify the ELV’s components and their locations.